

Compass Points

Esri • Summer 2010

GIS for Map, Chart, & Data Production and Spatial Data Infrastructure

Mapping Specialists Creates *The Ultimate Road Atlas* with ArcGIS

Established in 1984, Mapping Specialists, Ltd., began as an offshoot of the cartography lab at the University of Wisconsin, Madison. Since that time, the private company's cartographers have provided quality maps for encyclopedias, street mapping companies, and educational publishers for textbook maps and a wide array of materials for educational levels from preschool through college. The company also assists many federal, state, and local governments in producing quality publications for their agencies. "Maps can sometimes look deceptively simple to create," says Adam Derringer, manager of GIS (geographic information system) Services

at Mapping Specialists. Cartographers and researchers alike have a hand in the maps that are created both freehand and digitally. Each map means doing a large amount of research, whether created as illustrations to an author's text or used as guides to find a location. Think of the elegance of a *National Geographic* magazine map—each one is an exercise in cartographers' skills as they understand and capture in map form illustrative stories of everything from world wars to the impact of recent events.

From Guides to the Ultimate Atlas

While Mapping Specialists has historically used



Maplex software was used to carefully place labels in areas with dense information, such as in Madison, Wisconsin.

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Esri's GIS to create and manage map layers for its cartographic work, GIS didn't become a make-or-break prospect until the company began working with Rand McNally on the Thomas Brothers' road guides. These series of paperback, spiral-bound atlases feature detailed street maps of many large metropolitan areas in the United States. With hundreds of pages, maintaining this data in a graphics-only package became prohibitive. If a feature changed on one

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Enterprise Product on Demand Services Automated Map and Chart Creation at the NGA

The National Geospatial-Intelligence Agency (NGA) is a U.S. Department of Defense (DoD) combat support agency and a member of the national intelligence community. Its primary mission is to provide geospatial intelligence (GEOINT) to U.S. Armed Forces and government agencies in support of U.S. national security and aeronautical and nautical safety of navigation to a variety of users.

To better provide its users with access to timely, accurate, and relevant geospatial intelligence, NGA contracted with Esri Professional Services in 2004 for a new initiative known now as Enterprise Product on Demand Services (ePODS). One of the main goals of this project was to automate map and chart creation to gain efficiency and reduce errors. In addition, NGA sought to permit access to the most current NGA data in all domains, including aeronautical, nautical, and topographic, for selected customers. The ability to design and print custom maps was also high on the list of desired functionality.

The ePODS initiative yielded a Web portal allowing users access to the system from specific NGA networks built on service-oriented architecture (SOA) using Esri's ArcGIS system. ArcGIS Server and ArcIMS provide the GIS Web portal and services functionality, respectively. Esri Mapping and Charting provides a robust final touchup, or finishing, environment for aeronautical, nautical, and topographic maps and charts that NGA chooses to edit prior to publication.

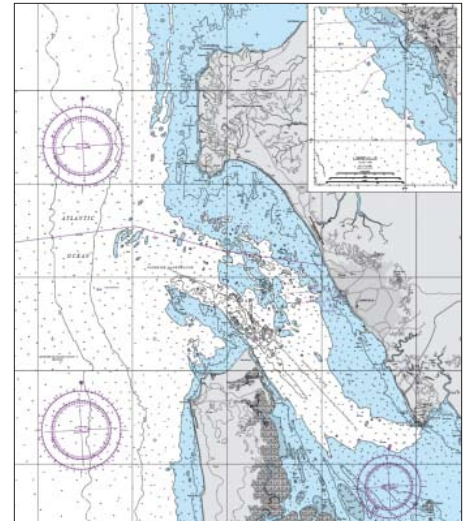
Using the Web interface, users select the data they need; configure it into a map; apply specific cartographic rules; preview the end product; and print it or download a source package that includes data, instructions, and media to work locally on the maps for further refinement. Output is produced in several formats including PDF, GeoTIFF, JPEG, CADRG, and geodatabase/ArcMap document (MXD) downloads.

As it continues to mature, ePODS offers more products to NGA's user community. In

April 2007, the ePODS program moved from being a prototype to an official program of record at NGA. This status provides funding through fiscal year 2015 and the opportunity to become part of NGA's life cycle processes. While ePODS maritime production has been ongoing since 2007, it recently passed NGA's Operational Readiness Review (ORR)/Operational Acceptance Review (OAR). This milestone was the final step in NGA's acceptance process and determined that the maritime service can be officially considered operational by NGA. Other services to undergo an ORR/OAR include Topographic Line Maps (TLM) (summer 2009) and OPAREA and tactical pilotage charts (TPC). Additional map and chart types will continue to be added through 2011.

The first iteration of the ePODS system went into production in September 2007 and provided immediate benefits. One example involved the SS *Curtiss*, one of the United States' Military Sealift Command's two aviation maintenance and logistics support ships. While under way to an overseas port, the crew recognized a need for an updated harbor chart for their destination. The crew notified the Naval Oceanographic Office, which dispatched a survey team to collect new data for the destination port and forwarded that data to NGA. Once it was received, a combined NGA and Esri team accessed the data with ePODS and produced an updated harbor chart in only two days. This updated chart was sent to the SS *Curtiss* within five days of receiving the data and was used by the ship's crew to safely sail into the harbor. Using traditional production methods, this same chart would typically take six to eight weeks to reach operational users.

In the summer of 2008, NGA was faced with another operational challenge—how to rapidly produce up-to-date nautical charts for the U.S. Navy and Coast Guard to use while supporting the Georgia-Russia crisis. Once again, NGA turned to ePODS and was able to produce six



Updated Harbor Chart showing approaches to Libreville and Owendo used by the SS *Curtiss* while at sea.

nautical charts of varying scales and rapidly disseminate them to operational users at sea. In the end, NGA realized an approximate 50 percent time savings over legacy production methods during this crisis.

The ePODS program has allowed and will continue to allow NGA to change its focus from producing cartographic products to providing the most accurate data possible to support its customers' needs. With the help of ePODS, NGA has significantly reduced the time required to produce maps and charts. For some maps and charts, production time has dropped from hundreds of hours to less than one.

NGA further increased its efficiency by using ePODS to determine on a case-by-case basis how much production time to spend on a product based on its intended use, eliminating the need to spend hundreds of hours finishing a one-off product that will only be used for quick analysis.

With ePODS, NGA can focus more of its resources on data quality, integrity, and currency rather than cartographic product generation. NGA is also able to provide its customers with timely access to relevant and accurate GEOINT data. Further, safety of navigation is significantly improved for both military personnel and civilians with the improvements in accuracy and timeliness of aeronautical and nautical charts.

Making Standards Shipshape

Esri's Rafael Ponce Discusses Working with International Hydrographic Organizations to Create Standards Worldwide

National hydrographic organizations, commercial chart producers, and naval commands are discovering that GIS technology can streamline the production and maintenance of their nautical data. Esri is assisting this effort by working with international organizations on the development of new standards.

Leading this charge is Rafael Ponce, program manager for Esri's maritime team in the Professional Services Group. Before joining Esri, Ponce spent 24 years in the Mexican Navy serving on various ships as well as ashore, participating in hydrographic surveys, bathymetric analyses, tidal analyses, and nautical chart production. He was the commanding officer of a navy hydrographic ship and the deputy director at the Mexican Office of Hydrography and Cartography.

Esri writer Karen Richardson recently sat down with Ponce to discuss ESRI's involvement in International Hydrographic



Rafael Ponce is the program manager for Esri's maritime team in the Professional Services Group. Previously, Ponce spent 24 years in the Mexican Navy.

Organization (IHO) standards and activities around the world.

Esri: Why is Esri involved with IHO?

RP: IHO is the technical expert body recognized by the International Maritime Organization, a

United Nations agency that provides standards and recommendations for all hydrographic activities throughout the world. This includes survey planning, data collection, postprocessing, and data product creation.

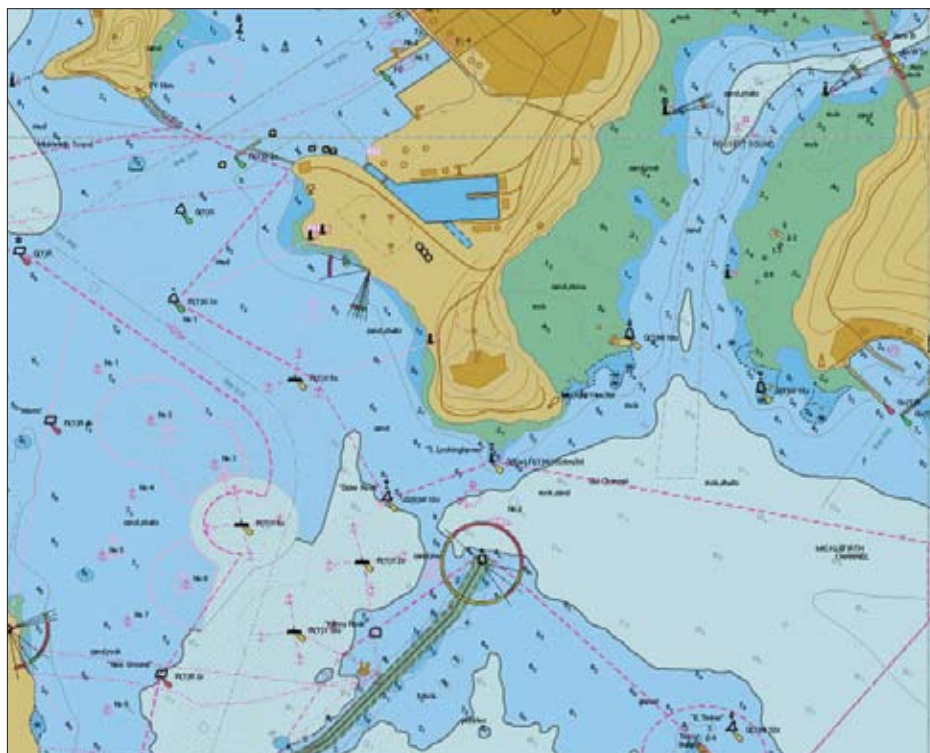
The Esri maritime team's primary objective is to serve this community by providing the best quality software and most efficient services. Our commitment does not begin with the production of excellent software and end with providing technical support; it goes beyond that. We are invested in creating standards and product specifications to continually improve our software.

Esri: How exactly does Esri contribute to the development of IHO standards and product specifications?

RP: The maritime team represents Esri at key IHO technical working groups, such as the Transfer Standard Maintenance and Application Development Working Group [TSMADWG]. We provide expertise for defining and documenting specifications and GIS tools for testing data against them. For example, Esri assisted in the development and extension of the S-57 standard, the IHO transfer standard for digital hydrographic data, as well as the new IHO Universal Hydrographic Data Model, known as S-100. Working with IHO, we are also developing the next generation of Electronic Navigational Chart [ENC] product specification, S-101.

Esri recently joined the Chart Standardization and Paper Chart Working Group to contribute to documents that help preserve the fundamental concepts of marine cartography. Additionally, we will start working with the Marine Spatial Data Infrastructure [SDI] Working Group to develop better marine SDIs and help hydrographic offices connect with their national SDIs.

Last, but not least, Esri is involved with the Radio Technical Commission for Maritime



Electronic Navigational Charts are becoming increasingly important in providing up-to-date navigational information and can be created, maintained, and shared using GIS technology.

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In Balance with Nature

Man and Beast Share the Shoreline in New York State Thanks to Spatial Data Portal

By Katie Budreski, Stone Environmental, and Karen Richardson, Esri

Ecosystem-based management (EBM) is the study of all the complex interactions within an ecosystem. Instead of focusing on only one issue or species, EBM strives to understand how humans and nature can coexist in a sustainable manner. Used mainly to study terrestrial environments, EBM has gained recent popularity in marine studies as communities search for solutions for ailing fisheries and struggling ocean ecologies. Spatial data plays a key role in assisting communities practicing EBM because this management approach is place based—the study is focused on activities in specific geographies.

New York State uses EBM for managing the state's northern Atlantic Ocean shoreline and its estuaries as well as portions of two of the five Great Lakes. To do this effectively, the state created *The New York Ocean and Great Lakes Atlas* (<http://nyoglatlas.org>) and geoportal (<http://portalnyoglecc.nyoglatlas.org>). The atlas is used by the general public, as well as local, regional, and state decision makers, to view and explore more than 400 datasets



Lake George, in the southern Adirondacks, is one of more than 20 lakes popular to visitors every season, with spring river rafting, swimming in the summer, scenic ship cruising in the fall, and horseback riding in the winter.

about the region. Navigating the vast catalog of data through the geoportal is made possible with Esri GIS technology: the ArcGIS Server Geoportal extension (previously known as the GIS Portal Toolkit).

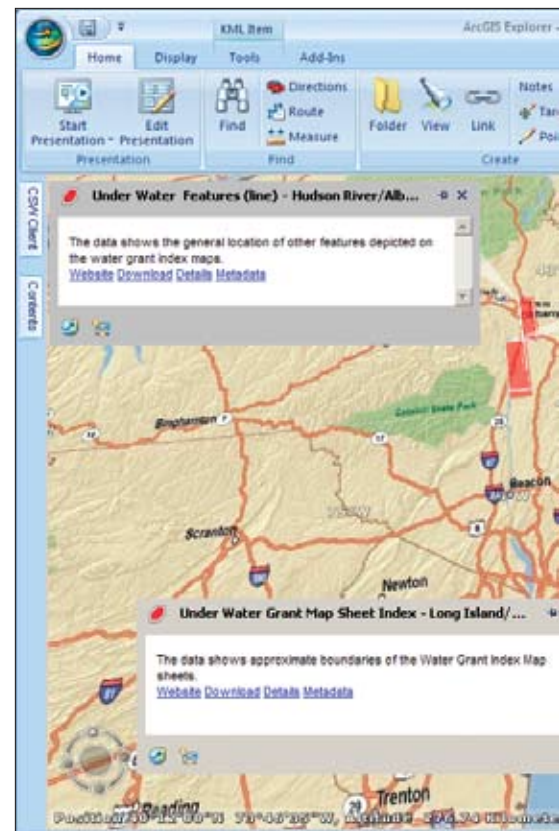
An Innovative Approach to Managing the Marine Environment

The atlas was developed by the New York Ocean and Great Lakes Ecosystem Conservation Council. The council, created in 2006, is chartered with protecting, restoring, and enhancing New York's ocean and Great Lakes ecosystems while taking into account sustainable economic development and job creation. The council is chaired by the commissioner of environmental conservation and composed of commissioners from many industries, including agriculture and markets, economic development, and transportation, as well as the secretary of state, the president of the New York State Energy Research and Development Authority, and the interim chancellor of the State University of New York.

Esri business partner Stone Environmental, Inc., based in Montpelier, Vermont, helped create the atlas. First launched in July 2008, the atlas comprises a Web-based mapping application and more than 200 datasets. Initially, users could view the datasets, download metadata and spatial data in multiple formats, and view attributes of the data. While the council technically met its mandate through this launch, it was clear from the start that an online catalog would be necessary to help navigate the sheer volume of datasets available.

A Portal Makes Data Searchable

The council reviewed several technologies, implementing ArcGIS Server Geoportal extension because it had the functionality the council required. Sophisticated searching ca-

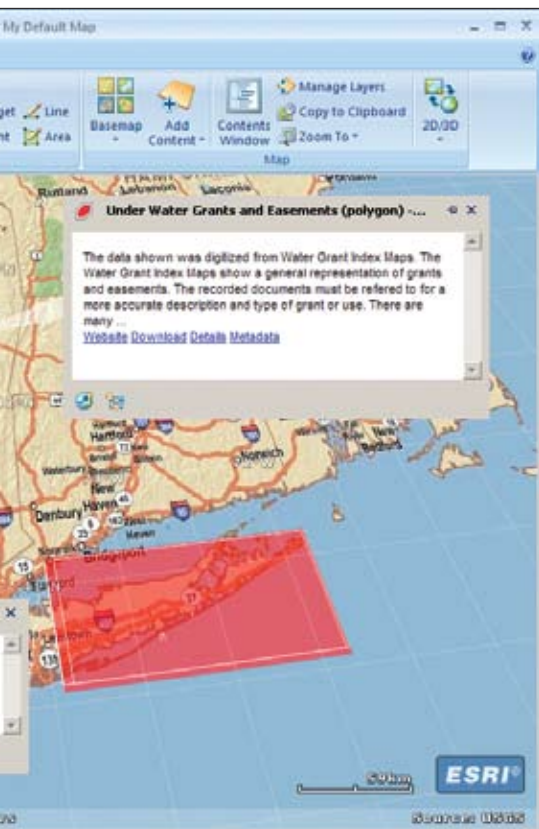


capabilities, the ability to establish user accounts and data provider access, and flexible metadata authoring tools were very important and readily available in the software. Additionally, Esri's open software environment aligned with the council's vision for future enhancements outlined in its five-year strategy document.

The portal provides a robust way for users to search all the data holdings in the atlas. Users of the portal can perform metadata searches by keyword, data type, data category, date modified, and geographic location. Information for specific areas of interest can be easily found and compared in this manner. Once found, the search results can be saved multiple ways: in a user profile; to a GeorSS feed; or as HTML or an HTML fragment, which allows users to embed defined blocks of HTML inside documents at key locations. Data can also be downloaded in various GIS formats, including Esri shapefile format, via an FTP link.

One-Stop Shop for Data

Finding relevant data was a huge task. Stone employed Web searches, phone calls, e-mails,



Many datasets are from organizations that had never widely distributed geospatial data before. An example is the Facility Limit Measurement Violation data from the New York Department of Environmental Conservation (NYDEC) Water Division. This data provides information necessary for the Clean Water Act National Pollutant Discharge Elimination System Program and had been identified as a priority through a data needs workshop. The agency had resource and technical constraints with sharing the data through its own organization. Since NYDEC could provide the data via the atlas without having to host the data, this important dataset could be shared.

published by uploading metadata that has been created by a metadata editor based on Federal Geographic Data Committee (FGDC) and International Organization for Standardization (ISO) standards, such as that included within the Geoportal extension. Metadata can also be created using a Web form. In addition, data providers can establish a data harvesting relationship with the data portal through a subportal or Web-accessible folder. This allows the data portal to collect desired Web pages and extract necessary data.

The Tug Hill Commission GIS Data Portal (<http://24.39.214.21/GPT9/catalog/main/home.page>) is an example of a subportal. Tug Hill is a 2,100-square-mile remote rural region of New York located between Lake Ontario and the Adirondack Mountains. Several geospatial datasets were developed as part of an EBM demonstration project in the Sandy Creeks watersheds on the eastern shore of Lake Ontario. A separate data portal, the subportal was developed so the Tug Hill Commission could manage its own geospatial data holdings but still make the data available to *New York Ocean and Great Lakes Atlas* users.



Wetlands are among the most productive ecosystems in the world, comparable to rain forests and coral reefs. These wetlands, located in Wilson, New York, on Lake Ontario, are an example of one of the “biological supermarkets” that can be managed using *The New York Ocean and Great Lakes Atlas*.

and face-to-face conversations with staff from more than 300 organizations to find the data included in the atlas today. Since the first launch, more data has been added for a total of nearly 400 searchable datasets.

Data includes administrative boundaries; marine data, such as fish distribution and habitat and invasive species; elevations and cadastre; and environment and geoscientific information such as geology, groundwater, and soils, as well as societal information including historic sites and settlement information.

Publishers Control Their Data

When the atlas data portal was first launched, the council published the data and metadata provided by the data providers. Moving forward, the council will encourage data providers to publish metadata records directly to the portal and, where possible, host their own data through a subportal. Providing direct access will ensure that data is as current as possible for EBM planners and communities.

Data providers have several avenues to easily publish data using the portal. Records can be

Next Steps

This year, the New York Ocean and Great Lakes Ecosystem Conservation Council will work with Stone Environmental to integrate the data portal and data viewer, which are currently two separate applications, by upgrading to ArcGIS Server. Additional enhancements will include the incorporation of thesauruses for enhanced searching and the use of Web Map Services (WMS) and Web Feature Services (WFS) for data dissemination.

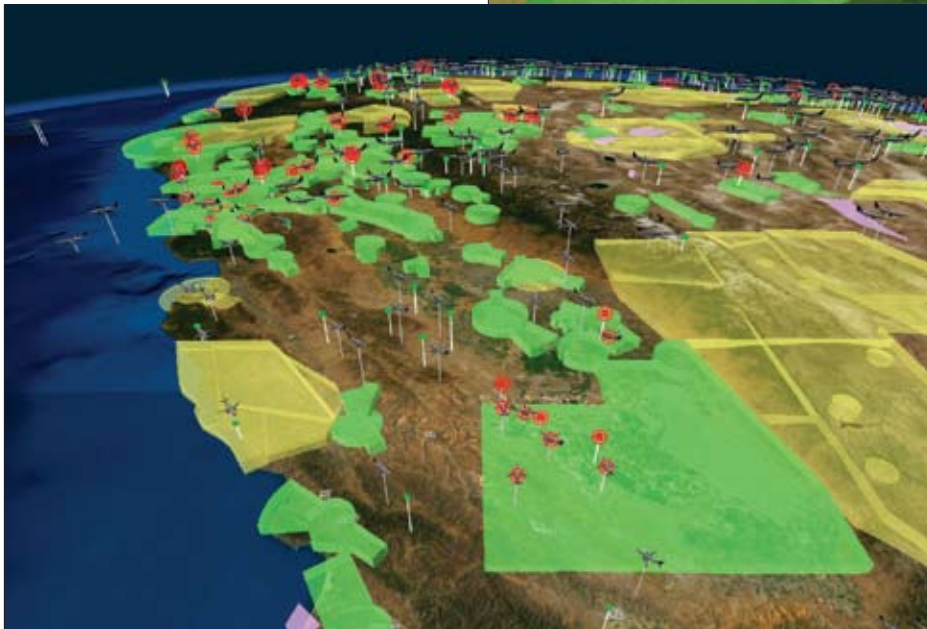
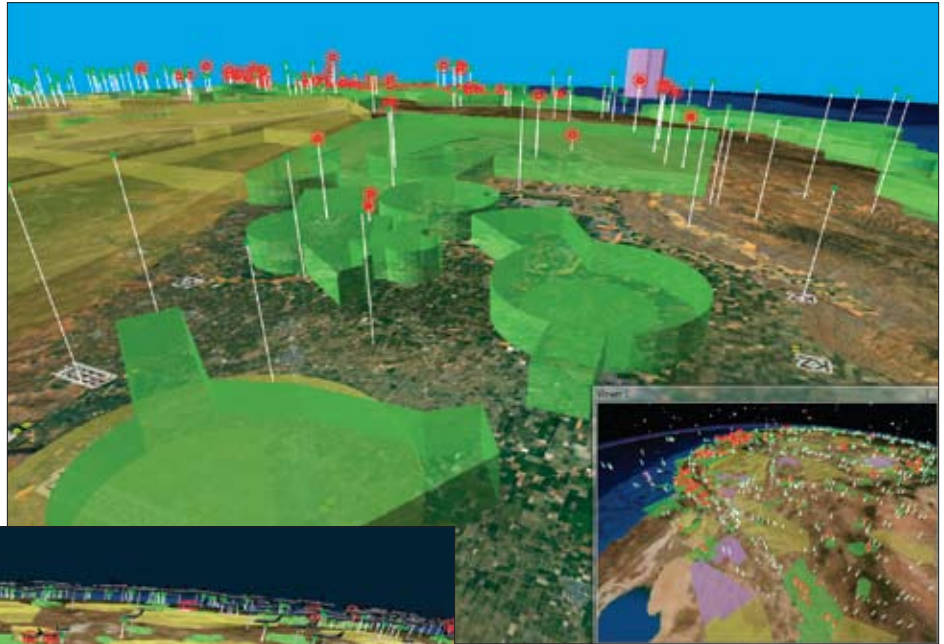
For more information, contact Becca Newhall, New York Ocean and Great Lakes Ecosystem Conservation Council program coordinator (e-mail: Rebecca.Newhall@dos.state.ny.us, tel.: 518-486-7736), or David Healy, Stone Environmental, Inc. (e-mail: dhealy@stone-env.com, tel.: 802-229-1879).

Esri Helps ICAO Improve Data Management and Workflow for Air Navigation Planning

Aviation Authority Shifts from Static Data to an Interactive Platform for Viewing, Planning, and Reporting Using ArcGIS

The International Civil Aviation Organization (ICAO) is making air navigation safer through more timely access to accurate data. Using ArcGIS Server, a server-based GIS from Esri, ICAO is creating a Web-based portal containing various global air navigation charts that can be viewed and accessed over the Internet.

Providing access to the data is particularly beneficial for the planning, monitoring, and analysis of newly planned facilities and services in regional air navigation plans (ANP). Having this information makes it easier for planning and implementation groups to expedite projects in accordance with ICAO priorities.



Using ArcGIS Server, ICAO is creating a Web-based portal containing various global air navigation charts that can be viewed and accessed over the Internet.

“Providing this information online greatly facilitates updating and accessing the latest information for ICAO regional offices and other users,” says Gilbert Lasnier, GIS services manager, ICAO.

The system is called the ICAO electronic Air Navigation Plan (eANP) GIS portal and provides access to the ICAO Global Air Navigation Plan database. Global air navigation plans that are available include air traffic

safety charts, flight information region charts, air traffic management charts, aerodrome operations planning, satellite images, regional charts, and many other thematic maps.

A variety of clients can be used to view and manipulate the data including Microsoft Internet Explorer, Esri ArcGIS Explorer, or any other ArcGIS Desktop client. To begin, a user opens a Web service; selects a region; then views, edits, or analyzes the data. What-if scenarios of new

routes and chart traffic information can be created and applied to the data. Users can also fly 3D electronic Terrain and Obstacle Databases (eTOD) in ArcGIS Explorer.

ICAO members, including regional planning and implementation groups, aviation partners, United Nations agencies, civil aviation entities, and ICAO staff, can browse and interact with the data. The public can access the GIS portal through the ICAO Web site.

By implementing Esri technology in a GIS portal, ICAO will be satisfying both the global and regional demand to replace paper air navigation plans, utilize ANP online viewers, view meteorology reporting, and provide easy access to data. For more information on how Esri GIS is used for aeronautical charts and maps, visit www.esri.com/aeronautical.

Swisstopo Breaks New Ground for Manufacturing Geodata products and National Map Series

The Swiss Federal Office of Topography (swisstopo) (www.swisstopo.ch) in Wabern, near Bern, is responsible for the creation and periodic update of geodesic, topographic, and geologic base data of Switzerland and for the production and update of the national map series. Swisstopo publishes the well-established and world-renowned topographic map series at scales of 1:25,000 up to 1:1,000,000.

To produce geographic data and maps, swisstopo is using innovative new processes, workflows, and procedures to decrease production time and ensure data accuracy. Vector data is maintained in a topographic landscape model (TLM) consisting of basic topographic data like land use, water, roads, and buildings. The TLM is kept very up-to-date for the whole country, is seamless over the whole region, and has a resolution better than one meter in three dimensions. The TLM is accompanied by a new digital terrain model (DTM) designed to be consistent at all times with the TLM. The DTM-TLM is derived principally from Lidar

data, and both the TLM and the DTM-TLM are photogrammetrically updated based on ADS40 imagery.

Several map products, including the national topographic map series, are created using digital cartographic models (DCMs) derived from the TLM. Like the TLM, DCMs are seamless. However, DCM data is 2D and cartographically enhanced.

Both the TLM and DCMs are processed and stored using ArcGIS. Updated information from TLM is translated into the DCMs.

The Topographic Geographic Information System (TOPGIS) is the central production environment for the TLM and is based on ArcGIS. Using ArcGIS, swisstopo can take advantage of a central database for capturing, editing, consistency checking, management, and storage of data. ArcGIS also allows TOPGIS to completely integrate photogrammetry and 3D GIS. TOPGIS has been in full-scale production since 2008 and provides GIS data to a large number of projects.

Genius-DB is a cartographic map production system for the national map series and is also based on ArcGIS. Genius-DB facilitates the management and editing of the DCMs, transformed out of the TLM using a third-party cartographic generalization tool. At this time, the Genius-DB project is in a pilot phase.

Swisstopo will produce a whole suite of DCMs, each of them corresponding to one of the various map scales and from which it derives its printed products like the Swiss National Maps series or the popular hiking maps as well as digital products like SwissMap. To simplify the work of the cartographers, the links between the features of TLM and DCM are maintained. This is of special importance when changes in the real world occur. When this happens, incremental updates are performed by modifying and editing only those objects that have changed since the last update.



This screen contains TLM data captured in front of an orthophoto. (Copyright 2009 swisstopo)

Collaboration through a Regional SDI

GeoSUR Opens Up Geographic Information for Use throughout South America

Ensuring that geographic information is readily available in South America is the mission of the GeoSUR Program, a regional initiative to integrate and disseminate spatial data in South America. GeoSUR was originally developed under the auspices of the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), which promotes the development of transportation, energy, and telecommunications infrastructure from a regional viewpoint. Since the program's inception in 2007, GeoSUR has grown to serve a large audience interested in development objectives, both regionally and within individual countries.

GeoSUR has three main components: (1) a geoportal, (2) a network of map services, and (3) a regional topographic processing service.

GeoSUR has developed, with support from the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center, the first regional portal providing access to geographic data and services from all South American countries (www.geosur.info). Launched in October 2009, it provides a point of entry to the map services and metadata catalogs operated by GeoSUR's partner agencies. GeoSUR chose ArcGIS Server Geoportal extension software to build the portal because it provides an efficient platform to integrate the diverse and changing geospatial resources located throughout the region.

A great variety of national and regional spatial data is available through GeoSUR, including information on topics such as political-administrative divisions, soils, topography, ecosystems, hydrography, biodiversity, water bodies, geology, cities and towns, elevation models, land cover, aerial photos, ecological regions, satellite imagery, and infrastructure, among others.

Most map services in the network contain geographic data at the national level, but there are two regional services available today: the GeoSUR Regional Map Service and the Condor Service.

The GeoSUR Regional Map Service is geared



Topographic services are available through the GeoSUR portal home page.

toward infrastructure developers, offering access to spatial data on existing IIRSA and Andean Development Bank (CAF) infrastructure projects and on themes that impact infrastructure development, such as roads, ports, airports, railroads, oil pipes, rivers, protected areas, land use and land cover, and relief. The service was developed with the support of the EROS Center using ArcGIS Server 9.3.1. All regional data in the service is available to download at no cost.

The Condor Service allows visitors to view environmental data of Andean countries, useful for planning infrastructure projects. The service includes an early assessment tool focused on identifying environmental risks and opportunities for projects in the planning phase. The Condor map viewer is available at esriurl.com/c3.

GeoSUR offers a Topographic Processing Service (TPS), the first of its kind in the developing world that provides access to digital elevation model (DEM) derivative products that can be generated on the fly for any location in South America. Users can run the service models using an assorted set of DEMs at different resolutions, including 1 kilometer, 90 meters, and 30 meters. The available TPS models include elevation profile, slope classification, dynamic watershed delineation, hillshade, elevation classification, aspect, and raindrop trace. The service is part of the GeoSUR Regional Map Service, available at the GeoSUR Portal

(www.geosur.info). All TPS-derived data can be downloaded free of cost.

Before launching the service, the USGS EROS Center filled the voids in the SRTM 30-meter dataset for South America with ASTER GDEM and GTOPO30 data and created a set of seamless derived datasets that include hillshade, shaded relief, slope, and aspect for the region.

Advanced users can directly use these models in ArcGIS Desktop by accessing the TPS GIS Geoprocessing service. From within ArcMap, local data can be used with this service to more precisely extract the derivative products and simply integrate them into the application. To further streamline the TPS service, users can integrate them in local ModelBuilder applications and Python scripts.

“Important development decisions are often taken without the proper use of geographic information and modeling techniques that are now becoming widely available,” says Santiago Borrero, secretary general for the Pan American Institute of Geography and History (PAIGH). “We hope that GeoSUR, as a mechanism to facilitate free access to geoinformation, will open the way for better decision making in the region.”

To read the full article, visit www.esri.com/geosur.

Using Imagery Subtly to Enhance Your Maps

Imagery is a popular GIS layer because of the realism it brings to maps. Online services like ArcGIS Online make it much easier to add imagery to ArcMap. With global coverage from both Esri (via the World Imagery service) and Microsoft (via the Bing Maps service), any map can get an instant facelift in just minutes!

Of course, imagery can also quickly overpower some maps. By using an additional layer and taking advantage of ArcMap software's ability to define a transparency setting, you can easily tone the imagery down, making it appear that it is being pushed further into the background of the map.

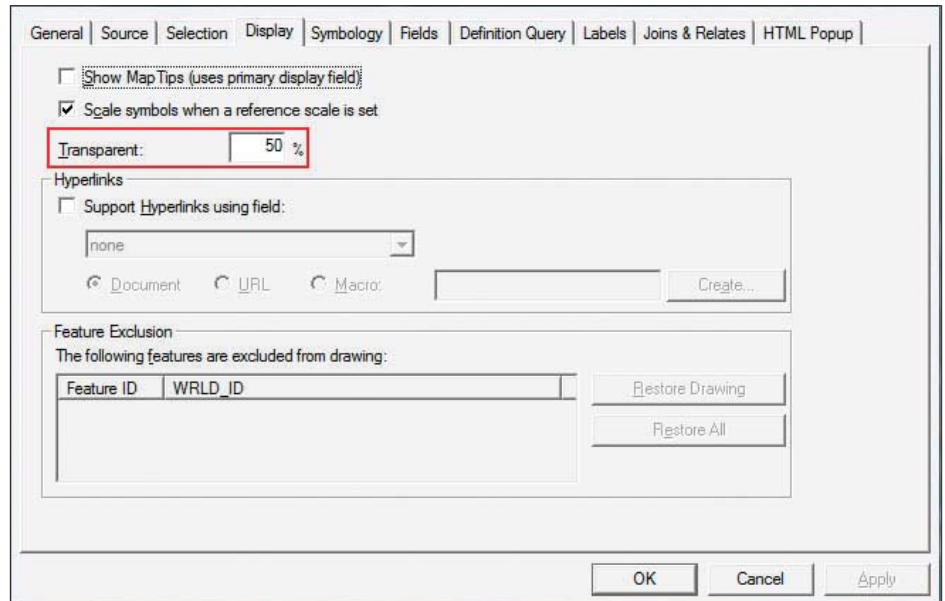
In just three steps, you can add imagery to your map, then tone it down so it doesn't compete with the other data.

1. Add your own imagery using the Add Data button in ArcMap. If you don't have your own imagery, use the File menu and click Add Data from Resource Center to add either the World Imagery or Bing Maps imagery service to your map.

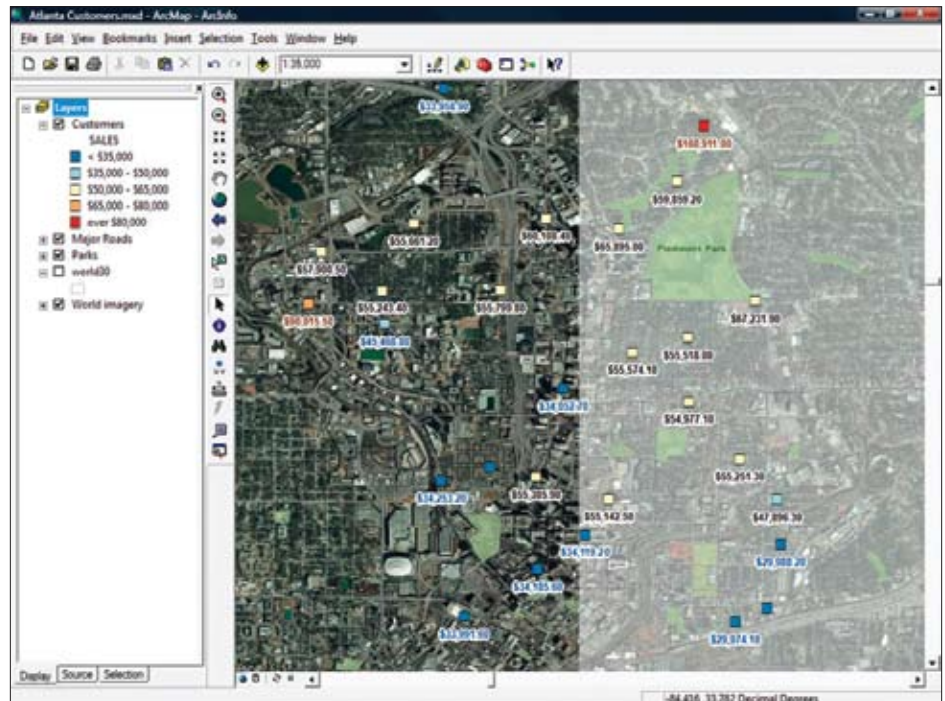
2. Add a polygon layer that will totally cover your map area. The ESRI Data & Maps world30 polygon is a good option.

3. Move the polygon layer so it is above the imagery layer and make it transparent. You can do this from Layer Properties. Activate the Display tab and change the Transparent value from 0 percent to something like 50 percent.

This technique works best when your map is showing point and line data. It can also be used to tone down other background layers. It is a simple but powerful way of helping your map readers focus on the data you want them to notice.



The Display tab allows you to set a transparency factor from 0 percent (not transparent) to 100 percent (totally transparent).



Using transparency when drawing imagery allows you to reduce its intensity. The left side of the map is overpowered by the dark imagery, but on the right side, the imagery doesn't steal the focus from the point data in the map.

Economic Growth through a Spatial Data Infrastructure

Croatia Makes Landownership Possible by Sharing Geographic Data through a National Geoportal

The Republic of Croatia, roughly the size of West Virginia, is home to more than 4.4 million people. Ranked as the 18th most popular tourist destination in the world, sightseers visit its beautiful national parks, the high peaks of the Dinaric Alps, and more than 1,000 islands in the temperate Adriatic Sea.

A successor state of the former Yugoslavia, Croatia declared its independence in 1991, which the European Union (EU) and the United Nations recognized in 1992. Building itself up from virtually nothing, it is now governed by a forward-thinking parliamentary republic that is adopting new laws to promote economic growth and help its candidacy for EU membership.

Making countrywide geographic data available throughout the nation with a spatial data infrastructure (SDI) is one way the country continues to grow. An online geoportal created with Esri ArcGIS Server Geoportal extension software makes this possible. The Croatian geoportal makes it easier for citizens, government, and private-sector users to find and access vast quantities of geographic information and relat-



This shows a view over the old city walls of Dubrovnik, Croatia, and its harbor.

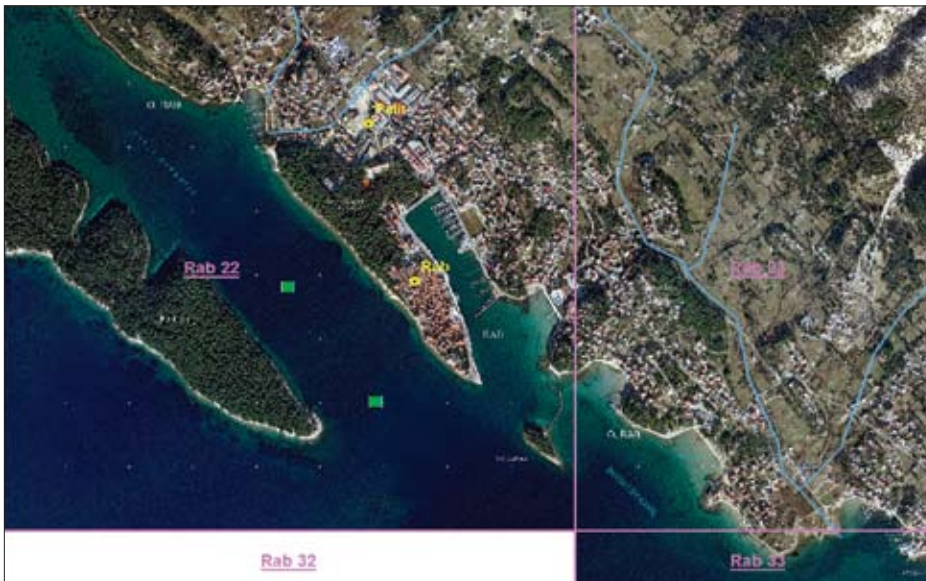
ed services. The geoportal is the first phase of a Croatian national SDI and has already shown its value by reducing the time it takes to register land within the country by 90 percent.

Enabling Property Rights in Croatia

Ten years ago, a simple land title transaction took an average of 400 days to carry out. Most information was stored and managed in paper-based files, making it difficult to share. Agencies such as the State Geodetic Administration (SGA), in charge of the country's official maps and cadastre, and the Ministry of Justice, responsible for land registers issued at municipal courts, could not easily exchange data.

In 2000, the Croatian Parliament adopted a State Survey and Real Property Cadastre Program to transform the existing registers into digital format. This involved topographic surveys as well as resurveying 5 percent of the existing cadastre, focusing on areas of special interest such as towns, coastlines, islands, nonregulated state agricultural land, and infrastructure corridors.

The datasets were cofinanced by federal institutions and interested local governing



As the first step toward an SDI, the cadastral data managed by SGA is now available for browsing, searching, and purchasing via an online data catalog found at www.geo-portal.hr/portal.

bodies. For example, orthophoto production was completed through 30 different agreements between local and state governments. Topographic data was collected, and each cadastre resurvey was conducted by 21 counties over a 10-year period. By the end of 2010, 56,000 cadastral maps will be digitized and verified.

Once collected, the data is gathered and housed in the Real Property Registration and Cadastre Joint Information System (JIS). The JIS unites the cadastral data managed by SGA and legal information from the Ministry of Justice. Having consistent and shareable data across the country is improving the process of implementing land reform because documents can be issued from both cadastre and land registers. The average time for processing changes to land titles has dropped from 400 days to fewer than 37.

Online Data Access through the Geoportal

As the first step toward an SDI, the cadastral data managed by SGA is now available for browsing, searching, and purchase via an online data catalog found at www.geo-portal.hr/Portal. The solution was developed by Esri

distributor GISDATA d.o.o. and con terra GmbH, the professional services arm of Esri Deutschland GmbH, using Esri's ArcGIS Server Geoportal extension.

Esri's Geoportal extension provides the platform for organizations to quickly access geospatial resources regardless of location or type. Working together, the companies established an action plan to develop a national SDI. Based on the EU's Infrastructure for Spatial Information in Europe (INSPIRE) Directive for sharing geographic information across Europe, Croatia's national SDI will provide more open, transparent, and efficient use of spatial information, as seen through the improved land registration.

SGA registers data with the geoportal by using metadata, which follows the ISO standards required by INSPIRE. Only the metadata is uploaded to the geoportal, while SGA's sensitive data remains securely housed within its own servers. Registered data includes digital orthophotos, 1:5,000-scale basemap information, raster cadastral maps, administrative units through the Central Registry of Spatial Units, and land survey information from the Registry of Geodetic Points.

"The Croatian geoportal is the first comprehensive NSDI [National Spatial Data Infrastructure] in southeastern Europe," says Mark Cygan, Esri manager of map, chart, & data production and SDI. "Croatia continues to be a leader in the region when it comes to the collection, management, and distribution of geospatial data."

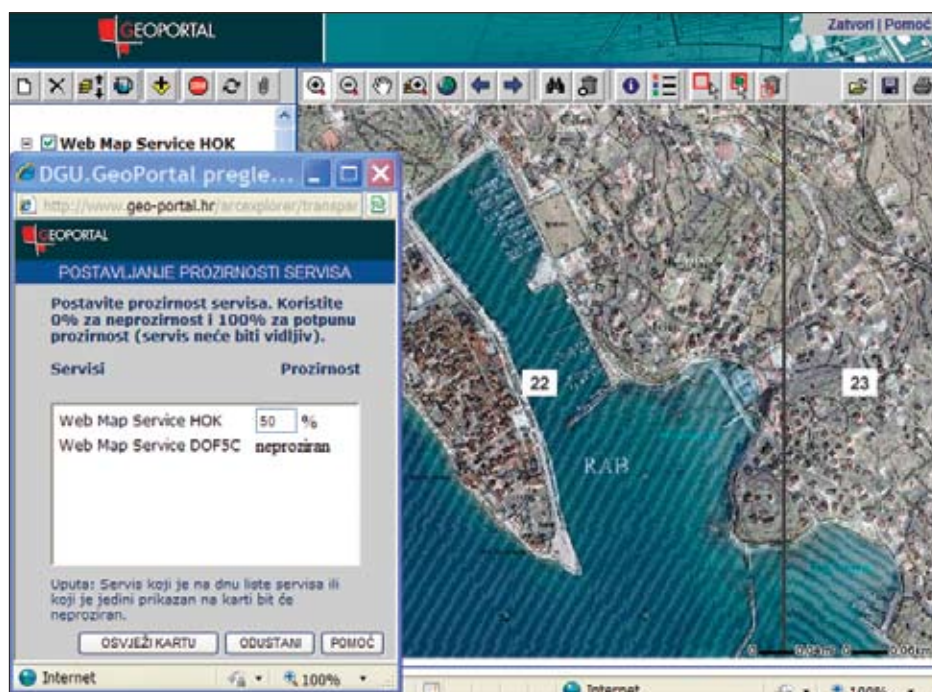
The First Step to a National SDI

By the end of the year, more agencies within Croatia will register their data with the geoportal, using the SGA data as a guide for resolution and standards. The Ministry of Defense; the Ministry of Culture; and the Ministry of Agriculture, Fisheries, and Rural Development will all provide spatial data.

Croatia expects to continue to see improvements in the reduction of time when producing and accessing data by creating a comprehensive SDI. Geospatial data and service producers in the government will be easily connected to the consumers who need the data. Data integrity will be maintained, and the users will more easily be able to share the authoritative version of data among themselves.

Dr. Željko Bacic, head of SGA, says, "Simple access to geospatial data is the key prerequisite for an efficient and economically prosperous society. [Having a] geoportal in operation means that other governmental organizations can [not only] use SGA data but also make their data accessible. This is the first step to the establishment of a Croatian national geoportal as part of an NSDI. I am convinced we shall do this soon, as we have a clear direction from the Croatian government and sufficient knowledge and capacity to achieve this."

The SGA geoportal has revealed opportunities in local and regional government for GIS users in nature conservation, urban planning, agriculture, public safety, and more. "The SGA geoportal is the first of its kind in southeastern Europe," says Andrej Loncaric, director of GISDATA for Croatia and the southeastern region of Europe. "Croatian GIS users now have access to vast quantities of geospatial data that will make their everyday work much easier."



SGA provides the platform for organizations to quickly access geospatial resources regardless of location or type.

The Barrick Gold SDI

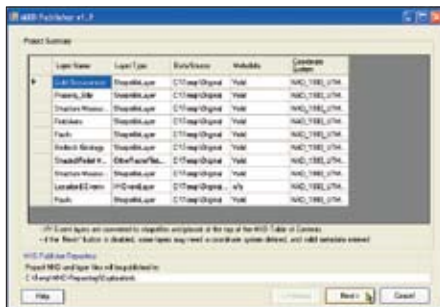
Spatial Data Infrastructure Secures the Future of World's Largest Gold-Mining Company

As the largest gold-mining company in the world, Barrick depends on its reserve base for much of the company's value. If its annual gold production of nearly eight million ounces isn't replaced, the reserve base, and Barrick's value, will decline. By making better use of its enormous collection of spatial data, Barrick knew it could dramatically improve the probability of making new gold discoveries, thus increasing reserves.

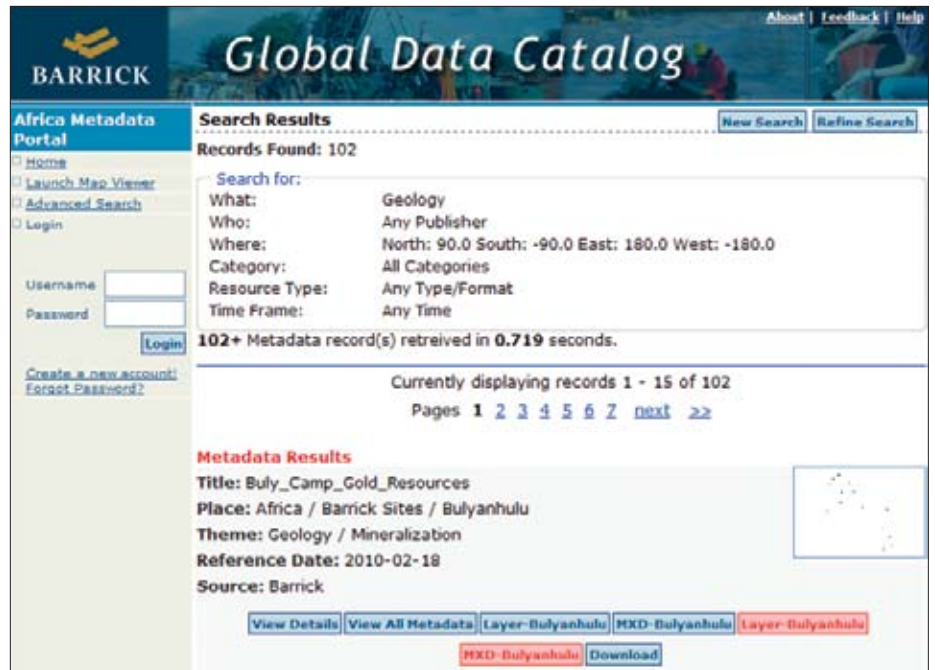
Impressive Shelf Life

Geologic data has an unusually long life cycle. Because ore-forming processes act over millions or tens of millions of years, data collected decades ago is still relevant to any mining company. Barrick has more than a quarter century of self-collected and purchased geology, geochemistry, geophysics, and remote-sensing data—as well as more than 100 years' worth of data inherited from acquired companies. Effectively managing this rapidly growing collection is crucial. To make best use of its impressive data archives, Barrick recently began an initiative to better organize and serve its data throughout the company. A spatial data infrastructure (SDI) was born.

Within a mining company, different departments often have data that other groups can use. At Barrick, surveyors collect as-built data for the mine site that is of interest to mine geology, security, health and safety, and exploration groups. An SDI simplifies the way spatial data is disseminated and accessed throughout an or-



Step one of MXD Publisher. A list of datasets is presented, indicating complete metadata.



Search results from a catalog search—The Layer and MXD buttons allow streaming from the portal server, or the data can be downloaded.

ganization. Says Iain Allen, global spatial data systems coordinator for Barrick, “Although our vast store of exploration data was the catalyst for the initiative, the project grew to include environment, land, security, and health and safety. Making every group's data available to everyone else eliminates the likelihood of duplicate data collection and/or purchasing.”

The Migraine of Fine Grain

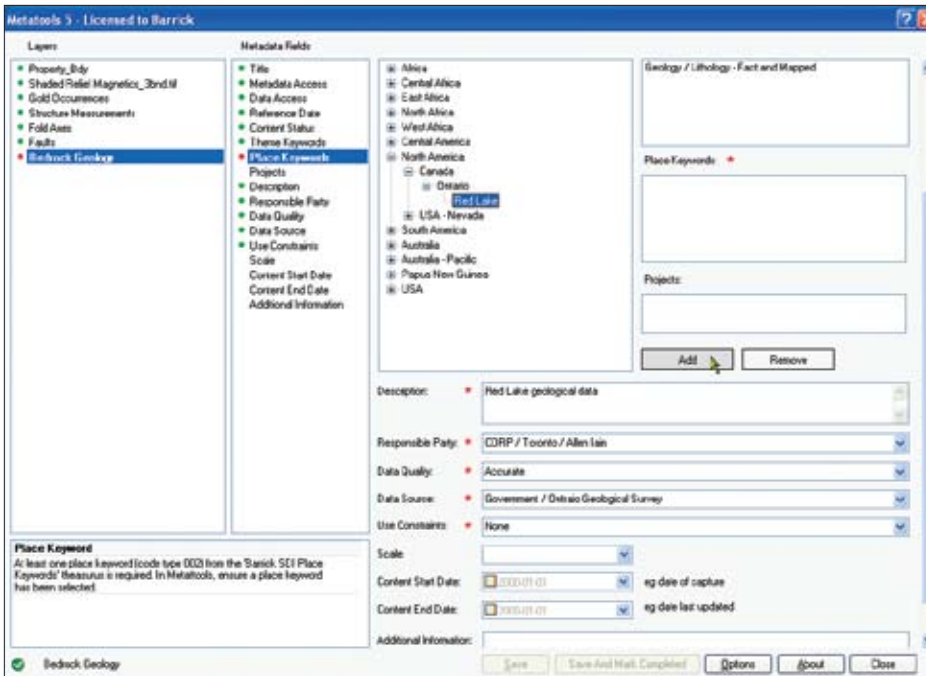
The crucial first step in creating an easily searched data catalog is generating metadata for each dataset. However, as anyone who has created metadata knows, the devil's in the details. “Everything depends on metadata, but no one likes to do metadata,” laughs Allen. “We use a custom metadata editor, MetaTools 5, by Peter Barrs of Data Arterial, in Stanthorpe, Australia, which runs in ArcMap as well as ArcCatalog.” ArcMap and ArcCatalog are applications inside ArcGIS Desktop. Barrick standardized on 14 mandatory metadata elements and 4 optional ones. “We do not have dedicated data managers,

so we depend on the end user for metadata. If it's too tedious, they won't do it. We tried to find a balance between everything we would like to know about a dataset and what we could realistically expect people to do.”

The Barrick metadata editor uses pick lists for every metadata attribute. The pick lists automatically sync with a server-based master keyword database every time the editor opens, ensuring everyone always has the most current set of keywords. Adding new keywords is done through a Web form, which adds them to the master database. The editor also facilitates the copying of metadata. By working in ArcMap, where the datasets typically have many common metadata attributes, Barrick can greatly speed metadata creation. The user completes all the common metadata elements for one dataset, copies them to all the other datasets, then completes the one or two remaining variable elements individually.

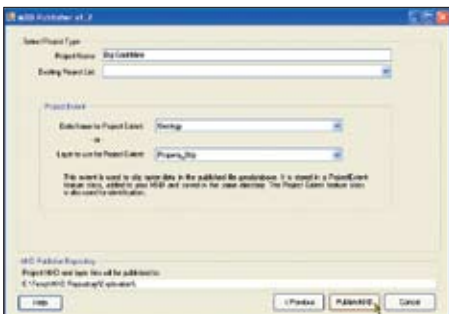
Publish or Perish

Detailed metadata is worthless if the data can't



A display of MetaTools 5, with seven datasets loaded (leftmost column), six with complete metadata (green dots) and one incomplete (red). The center column shows the 14 mandatory attributes for the incomplete dataset with 13 completed (green dots) and 1 incomplete (red). The rightmost column is where the attributes are assigned. The missing Place keyword is selected and about to be added (arrow).

be queried and accessed. To publish the data, Barrick uses MXD Publisher, created to Barrick specifications by NGIS in Australia. MXD Publisher, which will not allow data to be published if it does not have complete metadata, creates a file geodatabase at a specified location on the network, also capturing all the layer files and creating a copy of the MXD that references the newly created file geodatabase. “This is our way of overcoming ‘C-drive syndrome.’ We find that a lot of data exists only on particular users’ laptops, so no one else even knows it exists,” says Allen. “Through the MXD Publisher, all the datasets used in the published MXD are copied



The second screen for MXD Publisher, specifying the location of the MXD Repository (lower left) and the name of the file geodatabase being created.

to the network drive. Data previously available only on the laptop is now also available, with complete metadata, on the network.”

The final step in the Barrick workflow is handled by SDE Publisher, another custom NGIS tool, that publishes the file geodatabase on the network to the enterprise geodatabase in ArcGIS Server. Each night, a metadata harvester runs and updates the data catalog with the metadata for any new datasets (the data catalog uses the GIS Portal Toolkit [now called the ArcGIS Server Geoportal extension] for presentation and ArcGIS Server with SQL Server for storage). Dennis Geason from GIS Technologies in Anchorage, Alaska, was instrumental in setting up the back-end processes.

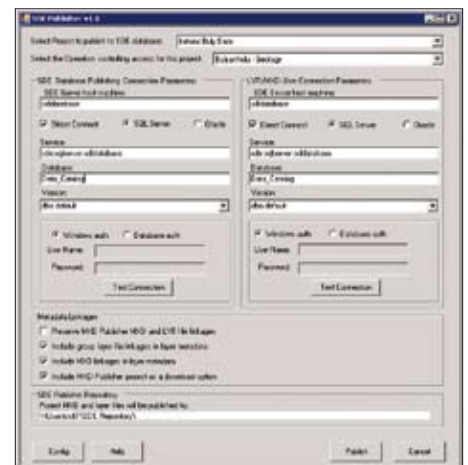
Search results include links to the individual datasets and to the source MXD. The results are presented with selected metadata, and buttons allow users to either stream the dataset or complete MXD from the server to their desktop client or download the data directly. FME Server is used for the ETL function, giving Barrick the ability to deliver search results in any format desired. This is important, as Barrick supports two desktop GIS packages.

Data Security

“People tend to be very protective of their data, so we have two data security-related metadata attributes,” Allen says. One controls metadata visibility; the other controls data access. This gives Barrick the flexibility to let everyone know a dataset exists (the metadata is added to the catalog and will show up in search results) but restricts data access to the group most likely to need it. If others want access, they must contact the responsible party (another metadata attribute) and make their case. For example, land managers want people to know whenever there is land data available for their search area, but they do not want people to have access to that data without consulting a land professional. This ensures that they are made aware of any confidentiality or area of interest agreements associated with the land polygon.

Future

By tagging its huge store of geologic information with metadata, Barrick has taken a significant first step in increasing the value of this data. Future work will include incorporating spatial data stored in other repositories, such as acquire for geochemical and drilling data and EarthSoft’s EQUIS for environmental data. Barrick will also serve data from the SDI to other applications, for example, vehicle tracking, where Web services from the SDI data provide context for vehicle movement.



The SDE Publisher Interface, ready to publish the selected file geodatabase from the MXD Repository to the Spatial Database Engine (SDE) Repository.

Sharing Geographic Data in Austria

ArcGIS Server Geoportal Extension Ensures That the Country's Data Conforms to INSPIRE Directives

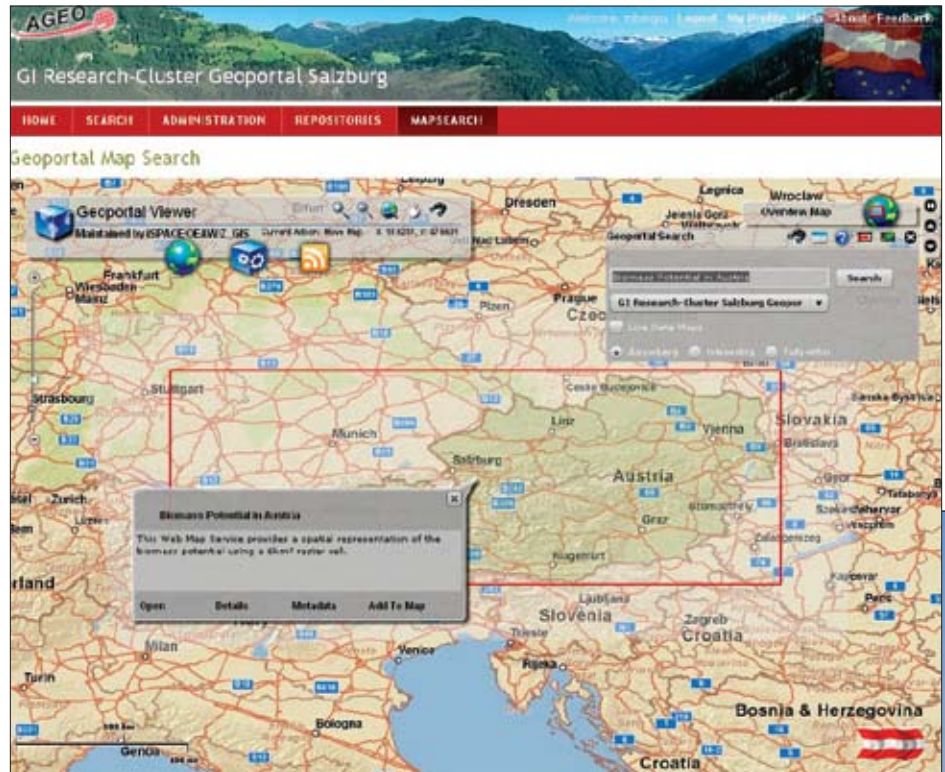
The country of Austria has been an active user of GIS for the past 25 years. It consists of nine independent federal states, each with its own provincial government. This has led to the creation and management of geographic resources being scattered across many organizations. Having disparate data sources makes it difficult to use the information to make more informed decisions on social and environmental issues. To solve this problem, the Austrian private and public agencies found it necessary to develop a coordinated spatial information system capable of data sharing and reuse on national and regional, as well as cross-sector, applications.

The system is a geoportal (<http://geoportal.researchstudio.at>) based on ArcGIS Server and the Geoportal extension. The geoportal allows a collaborative approach to developing a coordinated, comprehensive, and sustained information system. The Austrian Umbrella Organization for Geographic Information (AGEO) strongly supported the development of the geoportal.

Coordination across Austria

AGEO was formed in 1998 to make it easier to access geographic data throughout the country. The organization brings together national and municipal administrations, universities, and many different professional associations, representing the interests of the Austrian geographic information community at both the national and international levels.

In the last few years, this umbrella organization has focused its activities on supporting and promoting the development of a National Spatial Data Infrastructure (NSDI) within the framework of a European geographic information-sharing community. "The AGEO organization is concentrating its activity not only on public administration of geographic data but



Visualize biomass potential in Austria with Web map services.

also on business, academic, and—of course—general public interests,” says Josef Strobl, the current chair of AGEO.

At the European level, the Council of the European Union and the European Parliament set up the legal framework for developing an Infrastructure for Spatial Information in Europe, the INSPIRE Directive. The directive came into force in March 2007 (Directive 2007/2/EC) and aims to integrate islands of geographic information of varying standards and quality throughout Europe. Austria incorporated the INSPIRE Directive into its National Legislation, taking a first step toward implementing the requirements of the INSPIRE Directive in the country. The next step involves creation of communication mechanisms between producers and users of geographic information.



Metadata Makes Sharing Geographic Information Easier

One of the main difficulties with sharing data in Austria is the lack of comprehensible documentation for available spatial datasets and services. This could be solved by accompanying spatial data with metadata, which is structured information about the datasets. Unfortunately, many times, data producers do not understand the benefits of creating metadata and treat the task as boring and time consuming.

To address this problem, a national metadata profile was prepared combining specifications of international standards, INSPIRE's Metadata Implementing Rule, and existing regulations in the country. This profile, the Austrian Metadata Profile (profil.AT), ensures a consistent approach to geographic informa-

tion throughout the country. It specifies the metadata elements needed to increase the lifetime and value of spatial data and services. These include identification information, constraints or use restrictions, spatial and temporal extent, geographic resource maintenance information, spatial representation and reference, and the quality and the distribution of geographic resources such as access policies.

The Geoportal extension gives data producers an online metadata editor that supports an easy way to publish structured information about geographic resources conforming to the Austrian Metadata Profile. The Geoportal extension was chosen because it provides the technological keys for sharing and reuse of resources across applications, enterprises, and community boundaries and facilitates devel-

opment of a metadata editor that conforms to a specific metadata profile. The application includes the basic functionality of the Geoportal extension including the Metadata Editor tool, discovery functionality, a data visualization application, and a metadata harvesting tool that enables automated acquisition of metadata from other repositories.

Publish, Find, Bind

The geoportal application represents the bridge between data producers and users and follows the “publish, find, bind” pattern of Web architecture. The producers create data and services for their own business needs and publish corresponding metadata to the geoportal. Users formulate queries and evaluate the returned metadata records to decide whether the discovered data fulfills their requirements.

Using the geoportal's online Metadata Editor makes geographic resources discoverable in a straightforward manner. The publisher logs in to the geoportal and chooses either the spatial datasets or spatial services schema that matches the specifications of the profil.AT metadata model. Then, the user fills in information about the data or services through the Metadata Editor's interface and submits the metadata. If the user needs assistance, hints provide more information about what values should be input in a field. The generated metadata items are added to a metadata repository that is comparable to a library catalog. Users can find information about the availability of a particular document or book and also information about content, author, year of publication, and more. Since most Austrians speak German, the editor interface has been translated into that language for ease of use.

The available geoportal and the online customized Metadata Editor represent an important step toward shaping a National Spatial Data Infrastructure and a milestone in achieving the goals of the INSPIRE Directive.

For more information, contact Mariana Belgiu, Ph.D. student (e-mail: mariana.belgiu@oeaw.ac.at, Web: www.oeaw-giscience.org).



SDI gives access to geospatial data that helps preserve Austria's natural resources.

A Road Map to Meet INSPIRE Timeline

New Insights and Strategies for Spatial Data Infrastructure Presented at INSPIRE Conference

Solutions to help European Union (EU) member states follow Infrastructure for Spatial Information in Europe (INSPIRE) initiative time frames were presented by Esri and its European business partners at the INSPIRE Conference 2010 in Krakow, Poland, June 22–25. Esri's ArcGIS software, including the ArcGIS Server Geoportals extension, was demonstrated. The software provides the capability to create metadata for a country's geospatial information as required by the winter 2010 deadline.

Esri, con terra GmbH, and interactive instruments GmbH gave a preconference workshop and paper presentation at the INSPIRE Conference, describing a road map to meet the INSPIRE objectives. Attendees gained an understanding of how to transform, publish, and download existing data sources in an INSPIRE-compliant manner.

Esri's vision for INSPIRE was presented during the conference in the paper SDI Solutions for INSPIRE: Technologies Supporting a Framework of Cooperation. The paper identified challenges and reflected on the technologies and solutions that underpin a successful SDI.

“We are pleased to team with knowledgeable partners who can provide a pathway for supporting the INSPIRE initiative, including non-technical aspects such as capacity building and organizational setup,” says Guenther Pichler, business development manager, Europe, Middle East, Africa (EMEA) Group at Esri. Ubiquitous and interoperable access to spatial information from a wide range of sources is key for decision making. European governance will be more efficient and effective, specifically regarding the sustainable management of resources and the environment. Learn more about Esri's solutions for INSPIRE at www.esri.com/esri-inspire.

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Follow *Compass Points* newsletter editor and team writer Karen Richardson at @mudmo.

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Compass Points E-newsletter

Compass Points also comes as a quarterly e-newsletter that provides information for GIS users working in national mapping and charting, SDI, and cartography. To subscribe, please visit www.esri.com/compasspoints.

Indian Government Selects Esri's Image Processing Platform

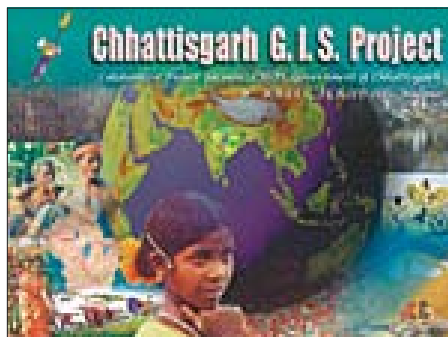
After an extensive competitive analysis, the Indian Space Research Organisation (ISRO) selected Esri's image management software platform to equip its five Regional Remote Sensing Service Centres (RRSSCs) with ArcGIS Server and its Image extension. The RRSSCs in Jodhpur, Dehradun, Kharagpur, Nagpur, and Bangalore use Indian Remote Sensing (IRS) satellite and other imagery to create thematic maps and GIS databases that provide valuable societal applications to various government agencies throughout India.

With India's success in remote-sensing technology through the IRS constellation, several new imagery-based and GIS-centric projects of national relevance are gaining visibility and importance. ISRO is presently implementing major programs related to natural resources, disaster management, environmental oversight, and groundwater and watershed management.

The remote-sensing centers are establishing a distributed architecture of server-based solutions designed to be the foundation for publishing, hosting, and serving images and data. Over time, RRSSCs have collected large volumes of map data and integrated them with developmental attribute data. The centers plan to combine and assimilate all the data with new-generation IRS high-resolution images and serve the data and application sets across the government sector.

The RRSSCs needed a GIS solution that met their needs and was scalable to meet growing demands for services from a large number of users for a variety of advanced applications. They selected Esri's proven technology and superior solutions after several rounds of technical presentations, demonstrations, and discussions. RRSSC and NIIT GIS Limited (Esri India), Esri's distributor in India, have concluded a comprehensive training session, and RRSSC users have started developing the solution.

Dr. Yvn Krishnamurthy, director of the RRSSCs, says, "ISRO users have been using Esri products for a variety of applications, and many national programs have been based on GIS solutions. IRS imagery has been the source



ISRO implements major programs including those related to natural resources, disaster management, environmental oversight, and groundwater and watershed management.

of thematic mapping inputs and provides end-to-end solutions under the umbrella of the National Natural Resources Management System. ArcGIS Server with the Image extension is a robust and integrated product and has capabilities that can meet our application needs of serving images and thematic maps to a variety of users."

Dr. Mukund Rao, president and chief operating officer at Esri India, notes, "ISRO has been pioneering the use of IRS imagery and advancing GIS solutions for a long time. We are proud to be associated with them on this prestigious, first-of-its-kind national project to serve image- and map-based solutions in a GIS portal architecture."

ArcGIS Server helps users connect people with

the information they need via Web mapping applications and GIS services. It is built on a modern, service-oriented architecture. The ArcGIS Server Image extension makes it possible to take raw or preprocessed imagery and immediately deliver it as a Web service. It enables organizations to exploit the rich information content available in imagery and quickly access large volumes of imagery. This is far superior to traditional options that required significant efforts by users to locate and make file-based imagery available.

Says Lawrie Jordan, Esri's director of imagery enterprise solutions, "We provide powerful new tools that enable things to happen in near real time—like delivering and displaying imagery, roaming around the imagery, zooming in to the imagery, and doing on-the-fly mosaicking and orthorectification of the imagery."

Esri India envisions that this new software deployment and implementation will serve as a key reference within all Indian government agencies, especially those that disseminate and/or consume imagery and imagery-related data.

More Information

For more information, contact Narinder Thapar, Esri India (e-mail: narinder.thapar@niit-tech.com, Web: www.esriindia.com).

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Key Elements of the Dutch NSDI

By Sabine Put, Esri Nederland B.V.

A well-developed infrastructure is the basis for everything. Take the transport industry, for example. Who would be able to travel properly from location A to location B by car without a road network? Of course, one could argue that with a little effort, the trip can succeed. Nevertheless, the voyage will be far from comfortable and will take more time than necessary—and time is money. In a similar way, the basis for nationwide successful use of geoinformation is a National Spatial Data Infrastructure (NSDI). This involves the development of standards and agreements that enable the exchange and use of geoinformation.

Following the European guidelines developed in a project known as Infrastructure for Spatial Information in Europe (INSPIRE), the Dutch have pioneered an NSDI, and success is on its way with the many projects and pilots that have been or are currently being carried out. This article will explain some key aspects that characterize the Dutch NSDI and how it facilitates the success of all kinds of geoinformation users.

INSPIRE and GIDEON

To cope with the increasing amount of various types of geoinformation, the European Commission initiated INSPIRE with the aim being to harmonize the acquisition and dissemination of geoinformation. The resulting set of guidelines and regulations entered into force as the INSPIRE Directive in May 2007.

Although much work has already been done by the European Commission, the actual implementation of the guidelines by INSPIRE remains a serious effort. Crossing the Dutch border, GIDEON takes over the important role of implementing INSPIRE in the Netherlands. GIDEON describes the vision and long-term strategy of the realization of an NSDI. This strategy has been developed and is supported by a significant number of organizations, including ministries, universities, the Dutch cadastre, Stichting Geonovum, and several other governmental agencies.

This is the Interface of GeoSticker, the Dutch metadata editor that is widely adopted by many Dutch organizations.

Standards and Metadata

Regulations, visions, strategies—what is the actual impact on the various geoinformation users? An arbitrary user will probably formulate an answer containing the term *standards*. One who is more familiar with the concepts of an NSDI will also probably mention the term *metadata*. The latter especially is currently an important topic in Dutch organizations, as correct metadata is mandatory for following the INSPIRE Directive.

For those who are new to the concept of metadata, metadata can be compared to a tin can in a supermarket. Without a label, no one knows what is inside the can, let alone what the quality of the content is. No one (except for an adventurer, perhaps) will buy this can. Similarly, valuable geoinformation needs to be labeled properly. This can be achieved by creating correct and complete metadata.

However, one of the problems with metadata is that the existing metadata standards leave far too many degrees of freedom. In other words, the rules that describe how one should put the ingredients on the label of a tin can are not strict enough. The Dutch organization Stichting Geonovum is

concerned with this problem and has therefore developed Dutch metadata profiles on top of the existing ISO standards.

Obviously, for these metadata profiles to become a success, a metadata editor is required that continuously adheres to the currently valid standards. GeoSticker—the metadata editor developed by Esri Nederland B.V.—is now one of the leading products in the market. It is widely adopted by ministries, virtually all provinces, and many other organizations due to its ease of use and seamless integration with ArcGIS. The latest release of GeoSticker (version 3.0) supports metadata for not only geoinformation datasets but also Web services. Although ArcGIS does not directly support metadata for Web services, a few cunning workarounds now enable GeoSticker users to automatically create Web service metadata based on the metadata of the used datasets, provided that the metadata is correct and complete. GeoSticker makes labeling the cans a lot easier.

The Dutch as Pioneers

The road to an NSDI can sometimes be a harsh struggle, especially for the ones actually creat-

ing metadata and those who are trying to keep up with the latest standards. Nevertheless, taking into account the current status of metadata in the Netherlands, the Dutch can be considered pioneers. Part of this is thanks to the NSDI users and the people who are the driving forces behind metadata specifications and implementations. Bert Vermeij, senior business consultant at Esri Nederland, says, “These people provide us with great ideas and feedback to improve when it comes to metadata. They are always willing to participate in discussions on the topic. Just call them, and they will join.” On the problem that the given standards allow many different implementations, Vermeij continues, “The different implementations of the international standards is like wanting to screw a nut with a diameter of 5.9 mm onto a bolt with a diameter of 6.0 mm. It just does not fit very well. Fortunately, ArcGIS provides users with many tools to actually fit the two pieces together anyway.”

The combination of the ArcGIS platform and a custom product like GeoSticker allows a tight integration with the NSDI. This is the case not only within the Netherlands but also on a European level—ArcGIS forms the basis for a future SDI.

Geoportals Are on the Way

Standards and metadata are not the only key aspects of an NSDI. The acquisition, storage, and management of geoinformation is one thing; to disseminate it properly to a wide variety of users is another. Here, geoportals take an important role. A number of Dutch provinces have already started the deployment of a geoportals—both for their organizations and for their customers—and more are on the way. “Geoinformation supports primary processes that are essential for the tasks of our province,” says Guust Vriens, GIS expert at the Province of Noord-Brabant. “To realize this in a satisfactory way, it is very important to create and maintain metadata. Our geoportals can be used to search for geoinformation and to retrieve the metadata. In addition to this, the Province of Noord-Brabant has to exchange metadata and data with third parties. We have to provide services for several national and European geoportals [INSPIRE] as well.”

The ArcGIS Server Geoportals extension has proved very valuable to organizations that want to have their own geoportals set up. This is due to a number of reasons. First of all, the Geoportals extension can be deployed fairly quickly and has most of the required functionality already available out of the box. Second, geoportals built with the ArcGIS Server Geoportals extension are highly interoperable—they make it possible to combine bolts and nuts of various sizes. Next to this, these geoportals are easy to use and customizable. Finally, integration with other ArcGIS components saves the user much time and effort.

Plans, Pilots, and Projects

To accelerate the development of an NSDI, several projects have been initiated in recent years, two of which are described here. The first project concerns the development of a national geoportals, known as the Nationaal Georegister (NGR). The goal of this project is to aid the discovery and use of geoinformation for professional geoinformation users. “If the NGR contains sufficient and accurate records of geoinformation, it will surely save me a lot of time searching for data. Furthermore, it will stimulate innovative ideas and thinking,” says Gert-Jan van der Weijden, senior staff member at the Ministry of Housing, Spatial Planning and the Environment. The geoportals was launched in 2009 and now contains datasets and services from several different Dutch suppliers and organizations.

The NGR is built on open source technology to make it independent of any party. Fortunately, because the NGR makes use of open standards, ArcGIS can consume the contents of the NGR. For example, from a geoportals built with the ArcGIS Server Geoportals extension, one can search the NGR for data without having to leave the geoportals. For ArcGIS Desktop, an additional tool exists, known as the CS-W Client, which makes use of the CSW standard to search for data in geoportals and catalogs that support this standard.

A new project, started in 2009, is the Publieke Dienstverlening Op de Kaart (PDOK), or “public services put on a map.” The aim is to make geoinformation easily accessible for all users (in-

cluding citizens) through a solid infrastructure. A number of use cases will be demonstrated on spatial planning and the involvement of society in planning activities. An example of the latter is to encourage people to send geotagged photographs of their surrounding environments. In this way, governmental agencies get a better idea of what their citizens really think is important. Naturally, van der Weijden recognizes an important advantage of doing this project: “PDOK forces us to think about how to balance the supply and demand of geoinformation, not only within an organization but also between different organizations as well. Exciting!”

Future Developments

This article explained that the way that standards, metadata, and the dissemination of geoinformation are dealt with plays a key role in the development of the Dutch NSDI. Many enthusiastic people from a number of organizations exchange ideas and initiate projects to make the Dutch NSDI work in reality. However, there is always room for improvement, as current agreements and guidelines still leave too much room for different interpretations and implementations. Many ideas for improvements should come from the users, because they are the ones who face shortcomings on a day-to-day basis. Vermeij summarizes a possible solution: “The organizations responsible for developing standards should make agreements and rules even more strict than they currently do. The parties involved should take this challenge and reduce the number of possible interpretations of any agreement.” The basis of the Dutch NSDI is here—it should now be improved further to meet the needs of users to make them successful with geoinformation.

About the Author

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page, ensuring that it was updated on all other referenced pages was an arduous task. That is where using GIS became imperative; with a geodatabase, a feature could be edited once, and the change would be reflected on all pages where that particular feature was shown.

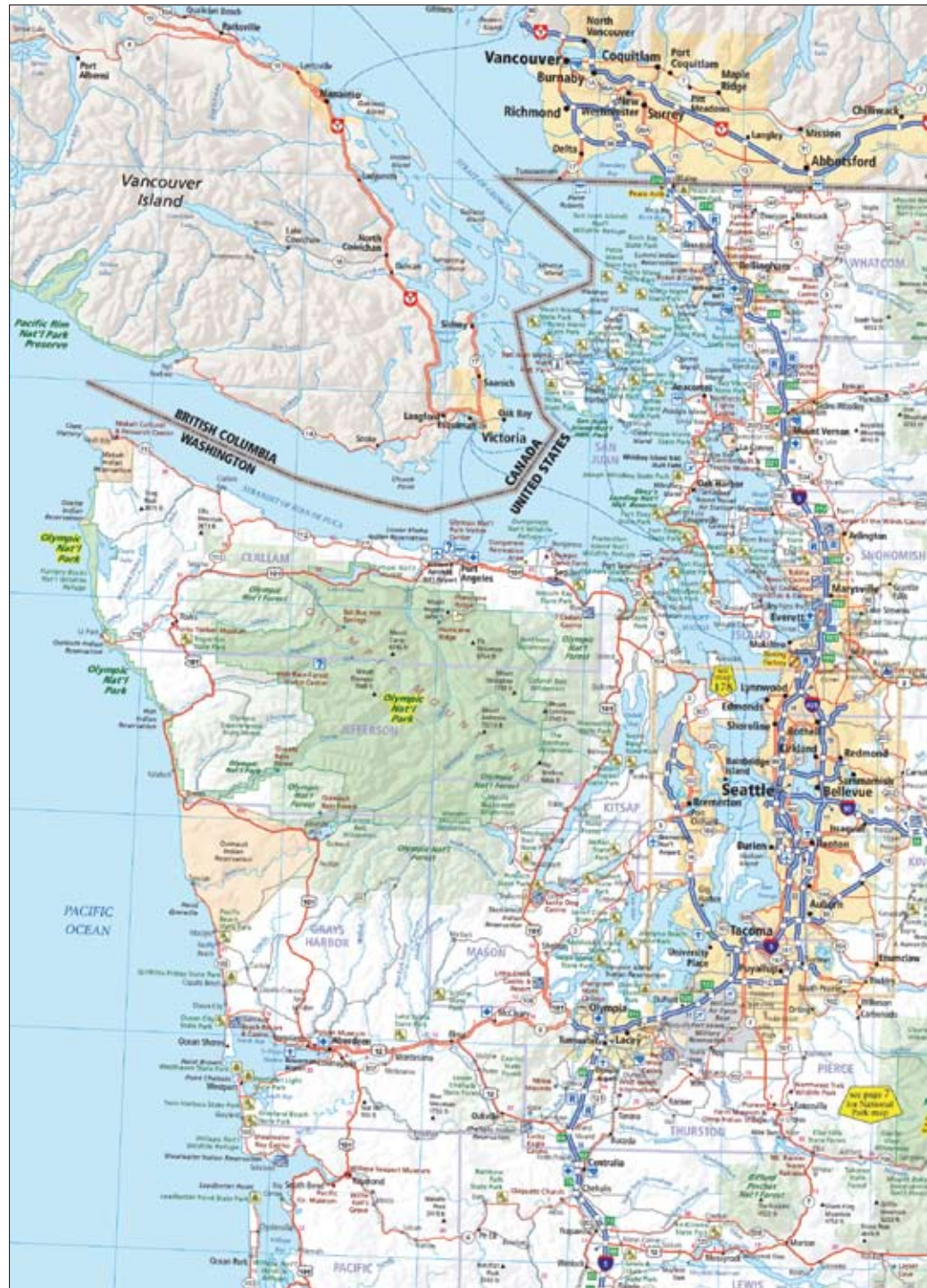
Having this experience allowed Derringer to take on another large project: a 224-page atlas designed for tourists and travelers as they explore the United States' vast highways. The atlas presents complete, updated road information and thousands of points of interest, such as a 24-page Traveler's Guide including information and maps of national parks as well as top picks for outdoor adventures, natural wonders, entertainment, culture, discovery, and unique examples of Americana—all highlighted on the atlas pages. Unique among American road atlases, the top of each map page describes several easy-to-find points of interest.

While the print market for maps has taken a hit since the dawn of GPS-laden iPhones and inexpensive personal navigation devices, Derringer explains that the atlas market has held up well. *The Ultimate Road Atlas* contains details such as a shaded relief map of the entire country, city inset maps, and a comprehensive small-scale map of the Northeast Corridor of the United States. This gives a thorough picture of roadways and tourist sites in the United States. Each page features complete latitude and longitude coordinates, making it the perfect complement to a personal navigation device. "You can't see all that information on a three-inch GPS screen," explains Derringer.

ArcGIS Instrumental in Completing the Project

ArcGIS, with a Microsoft SQL Server database, was used to store and edit data for the atlas. A team varying in size from 4 to 12 people created and edited more than 300 cartographic layers with the solution. Explains Derringer, "Cutting, editing, then reseaming hundreds of map pages would have been terrible—likely impossible—without ArcGIS."

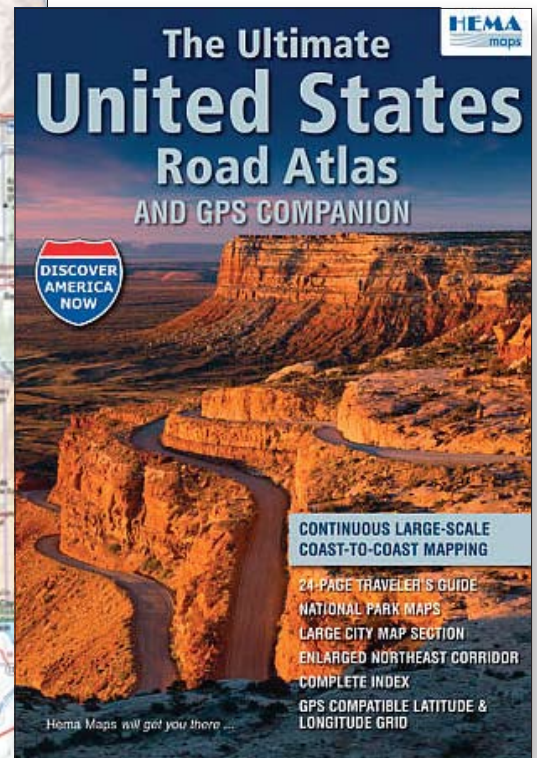
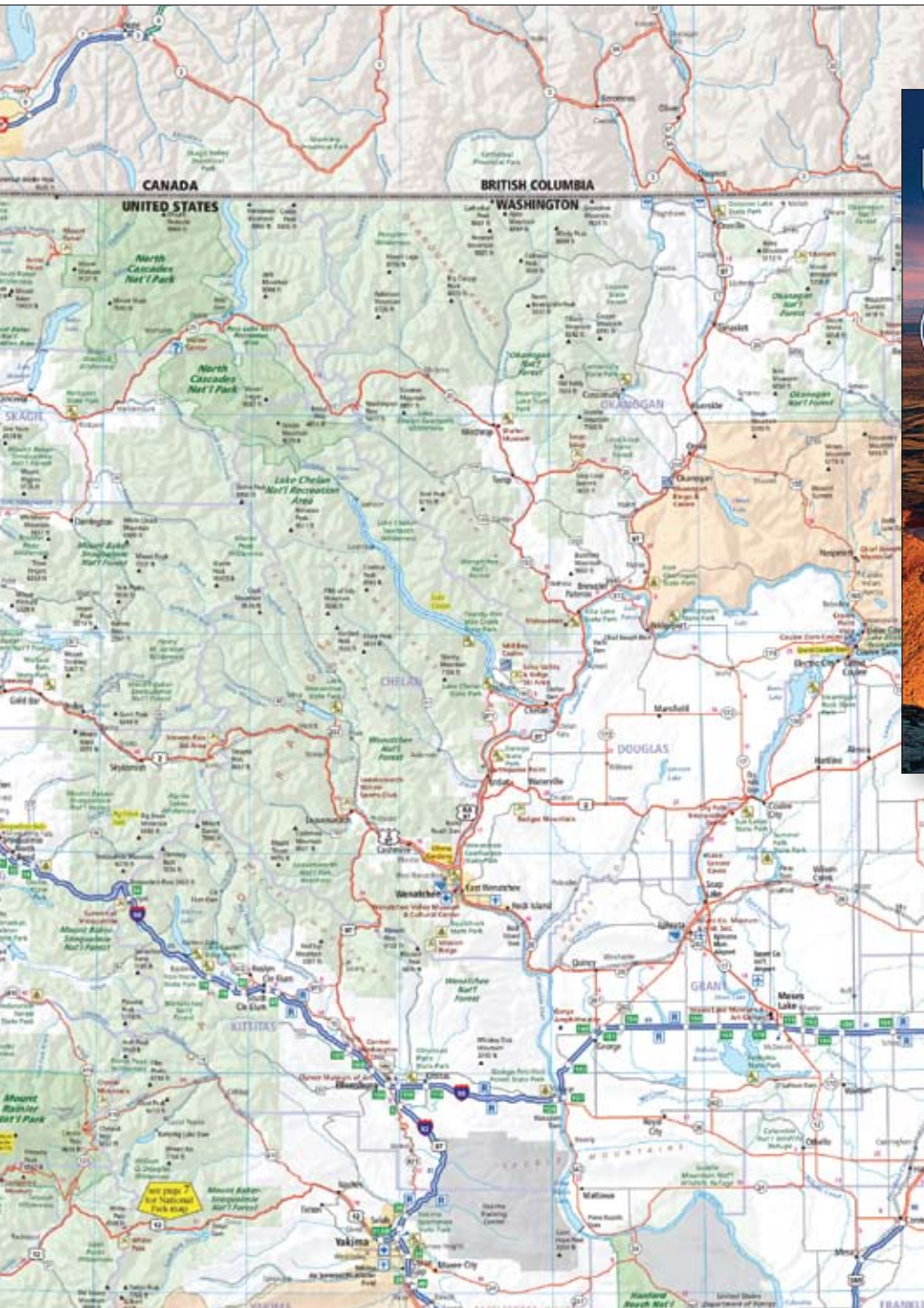
Data collection and editing took 18 months, with the first year focusing on collection. The



data was largely created by Mapping Specialists staff using available data from Esri and state and local governments as reference. Place points are located on the map page by GPS coordinates down to the second. Since many features are maintained in multiple datasets for different scales of mapping, the ArcGIS geodatabase was necessary to ensure that there were no conflicts in edited features and the versions used were the most accurate and up-to-date at all times. Working from the seamless geodatab-

base meant all data was available and could be used for multiple pages. This cut down on both data errors and file size.

A senior cartographer guided each group as the data was scrubbed and readied for placement on the map pages. Most editors had ArcGIS experience, but for those who didn't, training was straightforward and quick. "We spent more time on the rules for cartographic production than we did on how to run the software," says Derringer.



Mapping Specialists' road atlas contains 224 pages of road information and thousands of points of interest.

Label placement was the largest effort. Mapping Specialists created custom symbols for different feature classifications. Roads alone had six different classifications for how they were symbolized on the maps. Esri's Maplex software was employed for placement, but most text still needed to be touched by an editor. "In many cases, it was simply hitting the Maplex OK button," says Derringer, "but in others, the text needed to be moved. Maplex made what could have been a very time-consuming job

into something that was very manageable."

Mapping Specialists gained many efficiencies with ArcGIS on such a large project. "We used staff who hadn't done production work in more than 15 years," Derringer explains. "It took them only 45 minutes to get up to speed with the software. ArcGIS is a pretty effective tool for people, especially those who come from a graphics background."

Editors maintain they couldn't have completed the project without GIS to handle the many

page spreads and features. Having a complete geodatabase of features will make updating new editions of the atlas an easier task to manage. Much of the unique symbology created can be licensed to or used by other agencies for map production, from small publishers to national mapping organizations in need of creating a national atlas.

For more information on Esri's solutions for cartography, visit www.esri.com/maps. For more information on Mapping Specialists, contact Adam Derringer at 608-274-4004 or adamd@mappingspecialists.com.

ArcGIS 10 Will Transform How People Use GIS

A Simple and Pervasive System

ArcGIS 10 implements a vision of GIS as a simple and pervasive system for using maps and geographic information.

This release was called ArcGIS 9.4 in the beta phase. However, feedback from more than 2,000 beta participants indicated this update—featuring hundreds of improvements—should be called ArcGIS 10.

ArcGIS 10 will make GIS easier, more accessible, and more collaborative. It employs a much simpler user interface—a map. This mapcentric approach is used for interacting with, querying, editing, sharing, analyzing, and combining data.

The focus in ArcGIS 10 is squarely on helping users get more done. ArcGIS 10 integrates productivity tools that support the workflows of GIS professionals. Best practices templates incorporate intelligence that helps users get started quickly without having to worry about configuring the geodatabase.

A new, enhanced editing experience lets users accomplish editing tasks in a more intuitive, task-based environment. Users spend less time searching for tools and less time learning how to use them.

Commonly used tools for editing have been moved to a new toolbar that follows the user from task to task so it is always handy. The new toolbar for snapping is map based, and a new, quick pop-up helps users choose the desired feature.

Some enhancements were developed specifically for parcel editing tasks. The Create Features panel gives a more graphic, sketch-based way of creating features. The ability to perform bulk map feature editing and automated changes in parcel ownership that retain parcel accuracy help users spend less time accomplishing more.

At ArcGIS 10, users can search by keywords or data types to find data and maps. They can also use the search function to quickly and easily find symbols to use in their maps and tools for analysis.

Users can work faster because ArcGIS 10 is faster. The higher performance of ArcGIS 10



The new editing environment in ArcGIS 10 lets users accomplish editing tasks in a more intuitive, task-based manner.

results from averaging local graphics cards on desktops and improving cache generation and management, as well as optimizing Web graphics. These caching and Web graphic improvements translate into more responsive drawing performance that includes smooth, continuous panning of data.

This upcoming release also introduces the notion of time in both visualization and analysis. The software is time aware at the data, interface, and tool level. ArcGIS 10 lets users create, manage, and visualize time-aware data. They can display and animate temporal datasets as well as publish and query temporal map services. The ability to see data over time opens opportunities for more in-depth analysis.

ArcGIS has always been the premier software for spatial analysis. With this release, Esri advances geographic science with new tools. Using Python, the capabilities of ArcGIS can be combined with other scientific programming to create powerful solutions and automate common tasks.

Analysis and visualization in 3D is also improved in ArcGIS 10. At this release, ArcGIS becomes a full 3D GIS, offering 3D data models, editing, analysis, and visualization. It is much easier and faster to perform 3D visualization, and users can do virtually everything that they do in a 2D environment in a 3D environment.

ArcGIS is expanding GIS to be more fully realized on mobile devices. Now users will be able

to experience all the aspects of GIS on the mobile platform in the field and often in real time. This release makes GIS easier to use on Tablet PCs. Users can create custom applications, and ArcGIS Mobile also has a customizable, out-of-the-box application that allows them to extend ArcGIS. Esri is expanding this concept not only to Windows Mobile but also to the iPhone platform. Esri is providing a software developer kit (SDK) so organizations can build their own focused iPhone applications. The mobile platform enables the use of GIS information throughout organizations.

The expansion of GIS use is improved with added support for cloud computing. ArcGIS at 9.3 was cloud ready. ArcGIS 10 will be even more tightly integrated with the ArcGIS Online search and share capabilities. This makes it easier for users to create and distribute projects that may include data, layers, maps, tools, scenes, globes, diagrams, and add-ins.

Also at version 10, ArcGIS will be extended to support enterprise clouds. Any client can access these server-based resources and integrate data through mashups and APIs. In addition, Esri is collaborating with Amazon Web Services (AWS) and has joined the growing community of AWS Independent Software Vendors (ISVs) building services and solutions in the cloud computing environment.

Another area where Esri has focused a great deal of energy over the last two years has been integrating imagery into the ArcGIS platform. With this release, ArcGIS is a strong platform for imagery. It dramatically improves display speed and builds on the notion of on-the-fly image analysis, now done on ArcGIS Server but soon available on the desktop. The image processing tools on the desktop furnish display speed that is extraordinary.

ArcGIS 10 is expected to ship during the second quarter of 2010. Find the latest information on ArcGIS 10, including podcasts and videos, at www.esri.com/arcgis10.

Making Standards Shipshape

Services [RTCM], which informs international agencies on maritime radio navigation and radio communication policy issues, changes, and technical standards development. Esri represents RTCM as a nongovernmental organization at the Hydrographic Services and Standards Committee [HSSC].

Esri: How does Esri's participation benefit the GIS users in these communities?

RP: Our users benefit in several different ways. They have the assurance that Esri's GIS solutions, including Esri Nautical Solution, which is an extension to ArcGIS specifically for this community, will always be up-to-date with respect to new standards and specifications. Being a part of these groups ensures that we hear our users' recommendations and that current and new specifications are supported in our software.

Esri: You mentioned the Radio Technical Commission for Maritime Services at the IHO Hydrographic Services and Standards Committee; can you tell me more about RTCM and why Esri represents it?

RP: RTCM was founded in 1947 as an international nonprofit, scientific, professional, and educational organization. RTCM works closely with many international bodies to develop standards for different maritime services. RTCM has several special committees, and Esri's interest lies in Special Committee 109 on Electronic Charts and the fairly recent e-navigation concept, which aims to harmonize ship- and shore-based systems through a communications infrastructure. Working with this committee, Esri hopes to provide the technology to make this concept a reality.

Esri: Tell me more about Esri's relationship with IHO.

RP: Esri's relationship with IHO began with the International Hydrographic Bureau, which works as the secretariat for IHO. Esri maintains communications with delegates to the bureau, who include administrative personnel and re-

tired hydrographers from various member states.

The IHO recognizes Esri as one of its main stakeholders in private industry, allowing the Esri maritime team to participate in IHO's technical working groups and contribute to improving hydrography around the world. For example, Esri attended the Hydrographic Database workshop hosted by the Colombia Hydrographic Office in Cartagena last year.

Esri: Are there other groups within IHO where Esri is contributing?

RP: Yes, besides technical committees and working groups, the IHO has a capacity-building committee [CBC] and several regional hydrographic commissions. As part of CBC, Esri offers its expertise and software to help with ENC and computer-assisted nautical cartography production at hydrographic offices that have limited budgets and capacity. Esri participates in seminars and presentations for the South East Pacific Hydrographic Commission and the South-West Atlantic Hydrographic Commission. I also have the privilege of being the technical coordinator for the Electronic Chart Committee [ECC] of the Meso-American and Caribbean Hydrographic Commission [MACHC].

Esri: Can you describe your role as technical coordinator of the ECC in MACHC?

RP: I support the committee as a facilitator in determining the level of ENC coverage in the region using World-wide ENC Database [WEND] principles as a guide. The WEND principles are a series of guidelines on how IHO member states should produce, organize, and distribute their ENC data. Because ENCs cannot overlap for safety purposes, I help identify issues where there is a problem and facilitate a resolution. For example, two different ENCs may pinpoint more than one object at the same location. It is impossible for more than one object to be in the same spot on the earth, so I work with the conflicting states to rectify this. I also provide advice if some member states require rescheming of their ENC catalog. I basically try to ensure

that member states follow the IHO standards for production and distribution of charts to their end users, who are mariners worldwide.

Esri: Is Esri a member of other maritime organizations besides IHO?

RP: Yes, Esri recently joined the Technical Advisory Group on Port Security, which serves the Inter-American Committee on Ports [CIP] at the Organization of American States. This group provides guidance to port authorities in the Americas on all aspects of port security so that they have the information and necessary means to mitigate risks, improve security, and increase efficiency at ports throughout the Western Hemisphere. Esri, as an associate member, will provide expertise toward the best use of GIS technology for port security.

Esri: What can we expect from Esri's involvement with IHO and other maritime organizations in the coming year?

RP: Esri is committed to continuing our efforts with IHO and its member states in particular, participating in the development of S-101 and any future specifications. Our work with RTCM will continue, specifically in Special Committee 109 for Electronic Navigational Charts, as well as continuing to represent the group at HSSC if we are allowed the honor.

We look forward to promoting the Marine Spatial Data Infrastructure initiative by IHO among its member states. We are especially looking forward to working on other international projects like the Infrastructure for Spatial Information in Europe [INSPIRE], where we were recently accepted to participate in the development of product standards for bathymetry and oceanography.

Esri is heavily invested in research and development. This is beneficial to our users and ensures that our software and services are at the forefront of the latest technology.

For more information on how Esri works within the hydrographic community, visit www.esri.com/nautical.



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