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GIS and Mapping Solutions

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EFFECTIVE LOGISTICS MANAGEMENT WITH GIS

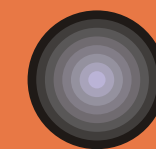
EVENT COVERAGE

ESRI INDIA

USER CONFERENCE 2008 REPORT

TECHNICAL ARTICLE

ARC HYDRO DATABASE FOR
ENTERPRISE WATER.....



ArcGIS Server Code Challenge Winners Revealed at 2008 ESRI Developer Summit

- Redlands, California

The winners of the ArcGIS Server Code Challenge were announced at the 2008 ESRI Developer Summit in Palm Springs, California, on March 19. Developers were invited to post their original code samples to the ArcGIS Server Code Challenge blog so that the code could be reviewed by peers in the ESRI developer community. Prior to the summit, ESRI Developer Network (EDN) subscribers and registered attendees for the 2008 Developer Summit were asked to vote for their favorite entry based on the creativity, applicability, and originality of the code sample.



John Waterman, vice president of Geospatial Solutions at GCS Research in East Burke, Vermont, won the first-place prize of \$15,000. His code sample demonstrates how ArcGIS Server can be integrated with Microsoft Virtual Earth and Google Maps. David Bouwman, senior software architect at Data Transfer Solutions in Fort Collins, Colorado, took second place and \$7,500 for his ArcGIS Server Virtual Earth Tile Server entry. Vijay Sambandhan, GIS developer at Bergmann Associates in Buffalo, New York, took third place and \$2,500 for his SDE Web Catalog code sample. Nianwei Liu, senior system analyst programmer at the City of Charlotte, North Carolina, received honorable mention for his entry, Google Maps Adapter to ArcGIS Server Map Cache.

"The ArcGIS Server Code Challenge was the perfect opportunity to demonstrate how easily GIS and custom databases can be added to Google Maps and Virtual Earth," says Waterman. "People want to use these programs for geospatial analysis and are already making use of the script I wrote, which is great to see."

Bouwman's winning entry used ArcGIS Server to create map tiles that can be brought into Microsoft Virtual Earth, implementing intelligent caching to save space and optimize performance. "I was able to convert Virtual Earth's tiling specification to a bounding box, which is then shipped over to ArcGIS Server to make the map image," Bouwman explains. "The application increases performance by using a dynamic caching process that kicks back images already contained in the cache. We are already using this code for a project with the Wildlife Conservation Society as well as a similar code with the Tahoe Regional Planning Agency. Both sites will be launched this summer."

Vijay Sambandhan's application displays ArcSDE data in a Web browser, bypassing the opening of a separate application. "I used open source JavaScript libraries to emulate ArcCatalog inside the Web browser so that users don't have to open another program to view their data and metadata," says Sambandhan. "Two people have already contacted me about using it, which alone is very satisfying. The win was an unexpected bonus."

Nianwei Liu's code sample brings existing ArcGIS Server resources into Google Maps including terabytes of spatial information from ArcGIS Online. "The focus of the adapter is to seamlessly serve the user's existing map caches with the Google API without having to maintain a separate and potentially costly map cache service. By combining the dynamic caching, spatial querying, and geoprocessing capabilities of ArcGIS Server, there are endless opportunities to build powerful yet easy-to-use geospatial analysis tools over the Web that are easily accessible."

You can see all the entries for the ArcGIS Server Code Challenge and download the code samples at www.esri.com/codechallengewinners.

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GIS—Supporting Capability, Enabling Interoperability



The fusion of data in defense systems demands an enterprise definition of interoperability.

ArcGIS software's open architecture enables defense developers, such as Concurrent Technologies Corporation, to embed powerful GIS capabilities into C4ISR applications.

Spatial capabilities need to be embedded into defense systems in every domain and at every level of command, demanding a robust definition of openness. The ESRI® ArcGIS® platform is engineered to participate in an enterprise information system environment. Interoperability is built into the heart of the ArcGIS scalable family of software products. This ensures the sharing of spatial data and applications throughout defense enterprises.



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From The President's Desk

From The President's Desk



Rajesh C Mathur
President, ESRI India

Dear Friends,

Recently I had the opportunity to participate in a discussion forum on GIS education organised by UNIGIS International, University of Salzburg, Austria. The session was attended by academicians, industry and other GIS professionals. The objective of the discussion forum was to review the current situation in India regarding availability of GIS Human Capital and the initiatives taken by the universities to train students interested in pursuing this vocation.

One of the speakers mentioned that the current annual output of GIS professionals from the academic institutions of India stands at about 1100 - 1300. In my view we have to scale up the GIS training capacity significantly in order to meet the future Human Capital requirements of the Indian user community. However, the more important issue that needs immediate attention is the course curriculum which should be aligned to the needs of the prospective employers.

In one of the earlier issues of Arc India News, I had mentioned that GIS technology has undergone a paradigm shift in the past decade. From proprietary architectures we have moved to open development environment; from desk top systems to server based enterprise solutions. Further, GIS is getting integrated with other IT sub systems like ERP, SCADA among others. These developments augur well for the GIS technology which is now getting accepted by CIOs as one of the core IT subsystems.

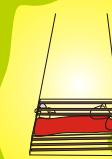
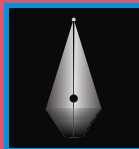
However, these technological developments also necessitate a thorough review of the GIS course curriculum offered by the academic institutions. Students interested in pursuing a career in GIS industry will require exposure to not only GIS and related technologies but also IT development tools like .NET, Java; RDBMS, Web tools et al. Students should also get the opportunity to acquire some knowledge of the domains in which GIS is being deployed. They should be given an opportunity to work on real life GIS projects which will give them a deeper understanding of the issues involved in implementation of GIS projects.

In my view while our university system is quite capable of creating the course content designed to meet the changed requirements, we must strengthen the industry university interface which will go a long way in creating courses which are more tuned to the current market needs. Further, students pursuing post graduate programs should be required to spend at least one semester in the industry as a project intern. This will enable them to work as a member of project teams and thus expose them to various GIS and IT tools used, system design methodologies and processes. Regular visits by professionals from the GIS industry to campuses to address students on latest technology trends will help students in keeping abreast of the technological developments.

We at ESRI India have launched several capacity building initiatives which are helping in creation of a pool of qualified GIS professionals. We offer special schemes to universities setting up GIS laboratories and offering GIS courses. In addition, we offer project internship, campus placement and also regular training programs on ESRI software products. Recently we launched a course on GIS data conversion at the Shimla Centre of NIIT. Soon it will be available in a few other cities also. Students also have the option to enrol for the courses offered on ESRI Virtual Campus.

India has the potential to become the most preferred source of Geospatial services globally. As the Indian geospatial industry moves up the value chain from database services to "end to end" GIS solutions, we will need large number of high calibre GIS professionals with deep knowledge of GIS and related software, applications and other IT sub systems. A joint effort by the academic institutions and industry will pave the way for creation of such world class manpower. The newly formed Geospatial Industry Association of India should also play a role in facilitating this interaction. Professional bodies like Indian Society of Geomatics can also actively participate in such initiatives.

Rajesh C. Mathur
President, ESRI India



WELL DONE ARCINDIA NEWS TEAM



Arc India news enriches the ESRI product users with lot of inputs that helps them to fresh up their knowledge so as to plan and execute their GIS projects in a reasonably minimum time frame. The pages on Tips & Tricks, which explicitly explains about the new ways for working with tables, map documents improvements and time saving shortcuts. Case studies helps the user to improve the methodology for their projects. Sharing of experiences of the experts through through extensive interactive interviews is also one of the best portions of the Arc India news. Further all other allocation of pages on different headings definitely new way of exposing the users to the software and the products. The day-to-day happenings and the academics information are quite necessary and useful for updating the GIS happenings around. In a word the presentation is excellent.

Further if the magazine publish the titles on the following and take advantage of the happenings on large scale with lot of market inputs. Even separate issues may be dedicated for different titles like Municipalities and corporations which is engaged in developmental and revenue activities, which include facility provision and income generation like collection of water tax, property tax and plan approvals. Power companies use GIS to monitor and analyse the electricity load on the grid network for a particular area. Transportation companies use GIS to help determine the best route for delivering their goods at less time. Retail trade companies using GIS to determine the best location for a new outlet. The magazine will become as an asset if more case studies, technical articles and news on seminars training and academic courses are find a place I the issues.

M. Devarajan
Manager GIS, Tamilnadu water supply and Drainage Board, (TWAD) Chennai.5

Geospatial information is becoming pervasive in various application domains and vital in decision making. Literature providing an overview of the development in geospatial technology and its application is scanty and the 'Arc India News' is a welcome addition. This commendable and novel initiative brings together development across the country and abroad by including case studies, product information as well as a peep into the potential GIS market scenario. I appreciate the proactive participation of ESRI in promoting use of geospatial technology.

Prof (Dr) V. Prasanna Kumar
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The editorial board members
would like to get feedback
from ESRI user community
about *ArcIndia News*.
Kindly send your feedback to
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ESRI India and Eka Designs Partner to offer
hardware and software for GIS applications

Eka Designs a leader in the design, development and manufacture of wireless products and technologies, announced availability of the SE-1 GPS and SE-3 GPS Module with Digital Compass specifically designed for the RICOH 500SE digital camera. Created to capture location information (With SE-1) and location information and direction (with SE-3) using the latest in GPS technology, the SE1 and SE3 provide a seamless approach to integrating images into GIS Applications

Combining GPS technology with digital imaging, the Ricoh 500SE GPS-ready ruggedized digital camera provides a new level of efficiency for integrating digital images into map-based (ESRI) software applications. Affordable and easy to operate, Ricoh's Geo-imaging solution provides the best alternative for GIS workflows that require quality image capture in the field. The geo-tagged images can then be sent wirelessly over a Bluetooth or WiFi network.

Mr. Rajesh C Mathur, President of ESRI-India comments, "The SE1 and SE3 GPS modules with RICOH 500SE allow us to seamlessly integrate location based information for GIS applications. The SE1 and SE3 enabled RICOH 500SE camera along with ArcGIS® will find applications for a range of verticals such as Military, Law Enforcement, Town Planning, Wildlife and Fisheries, etc."

Phani Sharma, Director of Eka Designs, said "We are delighted to partner with ESRI India, market leaders in the GIS space. Together we can offer complementing solutions for customers in India, who can easily and economically deploy GIS applications involving workflow"

The SE1 and SE3 along with RICOH 500SE are available from Eka and ESRI India.

To learn more about the SE-1 and SE-3, please visit <http://www.ekadesigns.com>

ESRI India and Sierra
Atlantic Joined hands

ESRI India, country's market leader in GIS solutions and Sierra Atlantic Software Services Ltd, one of the leading software company in India have jointly announced a new business partnership. Through this partnership ESRI India will now also offer the best in class Image processing software, ENVI to the users. Sierra will strengthen its portfolio by offering ArcGIS desktop products (ArcGIS ArcView, ArcEditor and ArcInfo along with extensions) along with their ENVI and INPHO product lines to its customers. Excited with this relationship both the companies are confident of providing the collective solutions to the larger user base and community in the country.

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GIS Capacity building A New Paradigm ...

The geo-spatial industry in India is poised for huge augmentation in the coming years. One of the major challenge in this is going to be capacity building which will enable the country to build the requisite human & technological capabilities in order to meet the emerging resource requirement of the geo-spatial industry in India. Aimed at building the data development capabilities for geo-

spatial industry, ESRI India in collaboration with NIIT has launched a course in Data Production. The first batch of 16 students successfully concluded their 60 Hrs classroom connect program from NIIT Shimla and are currently undertaking a one month on job training at our software factory in Parwanoo.



ESRI India NIIT is now
set to launch the next batch of
"GIS Intellectuals"...

ESRI India rated as Best GIS
Company to work for (in India)

GIS Development recently conducted survey for Best Company to work for (in India). This survey was done on two types of population - students in various GIS courses and people employed in the GIS industry. For students it covered areas like choice of stream, technology they are interested in, type of job profile, feel good factor and "preferred company to work for". For employees it concentrated on things like experience, satisfaction level, growth prospects, trainings and "preferred company to work with". The questionnaire was made available online at the portal & distributed at the recently concluded Map India 2008.

In both categories ESRI India emerged as a clear winner. In the employee category ESRI is the Preferred Choice in India followed by RMSI and the Govt. of India. Rolta India and Infotech followed in the order. Students also opted for ESRI as the first choice, followed by Rolta, RMSI & Bentley.

ArcGIS Engine

ArcGIS Engine is a set of desktop GIS components used to build custom GIS and mapping desktop applications or add new functionality to existing applications. Applications built using ArcGIS Engine can be stand-alone desktop GIS applications or ArcGIS Engine can be embedded in existing applications.

ArcGIS Engine applications can vary from simple map viewers to custom GIS editing and analysis programs. ArcGIS Engine provides application programming interfaces (APIs) for COM, .NET, Java, and C++.

With the ArcGIS Engine, developers can add dynamic mapping and GIS capabilities to existing applications or build their own unique mapping programs. ArcGIS Engine provides well defined, cross platform, cross language objects containing all of the ArcGIS functionality available outside of the ArcGIS applications user interface.

ArcGIS Engine is actually two products:

- ArcGIS Engine Developer Kit
- ArcGIS Engine Runtime

The ArcGIS Engine Developer Kit contains the components and tools for developers to build a solution and the ArcGIS Engine Runtime is the required infrastructure to run custom ArcGIS Engine applications.

Who will use ArcGIS Engine?

ArcGIS Engine availability will be a very important step in growing the use of GIS and mapping technology to solve problems beyond the traditional GIS-centric community. ArcGIS Engine will be of particular interest to

- The technically sophisticated, GIS-focused organisations
- Large organizations that need to develop enterprise GIS and mapping solutions
- Developers of third party solutions for building solutions for vertical industries
- Developers of non-GIS-centric applications who wish to add GIS and mapping functionality

Key Features

Standard GIS Framework: ArcGIS Engine Developer Kit provides a standard framework for developing GIS applications. The world's most popular GIS software (ArcView, ArcEditor, ArcInfo) is built from this same set of software objects. ArcGIS Engine is both robust and extensible, and its rich functionality allows developers to concentrate on solving organizational problems, not building GIS functionality from scratch.

Cost effective deployment: ArcGIS Engine Runtime is licensed per computer. This allows multiple ArcGIS applications to run on the same computer incurring the cost of only a single runtime license.

Developer Controls: ArcGIS Engine Developer Kit provides a common set of developer controls that allow developers to easily deploy well-crafted applications with a common look and feel.

A common user experience leads to a short learning curve for users so that returns on the applications are quickly realized. The following ArcGIS Developer Controls are included in the ArcGIS Engine Developer Kit:

- Map Control
- PageLayout Control
- Toolbar Control and over 100 tools and commands for use in the Toolbar
- Table of Contents Control
- Reader Control
- Scene Control
- Globe Control

Cross developer languages: ArcGIS Engine supports a variety of developer languages for its use including, COM, .NET, JAVA, and C++. This allows the objects to be programmed against using a wide range of tools, and should not require your programming staff learn a new or proprietary language. All of the ArcGIS Developer Controls will be available as ActiveX controls, .Net Windows controls, Visual Java Beans and Motif Widgets.

Advanced ArcGIS Functionality: The ArcGIS Engine Developer Kit includes advanced functionality to update and create an enterprise Geodatabase, work with 3D and global data and perform raster spatial analysis. This functionality is available to developer with the Engine Developer Kit and to end users of custom application via the ArcGIS Engine Runtime Options (Spatial, 3D, StreetMap, and Geodatabase Update).

Developer Resources: The ArcGIS Engine Developer Kit provides a help system along with object model diagrams and sample code to help developers get started. Several developer tools and utilities are also included in the Engine Developer Kit to facilitate development with the ArcGIS Engine.

Add'l Requirements Information

The system requirements for the ArcGIS Engine are the same as the ArcGIS Desktop products.

Hardware Requirements: CPU Speed: 800 Mhz minimum, 1.0 GHz recommended

Processor: Pentium or higher, **Memory/RAM:** 256 MB minimum, 512 MB recommended

Swap Space: 300 MB minimum. Utilizing Windows Terminal Server technology may require additional MB, depending on the number of clients running off the server.

Notes:

Internet Explorer 6.0 Requirement:

Some features of ArcGIS Engine 9.0 require a minimum installation of Microsoft Internet Explorer Version 6.0. If you do not have an installation of Microsoft Internet Explorer Version 6.0 or higher, you must obtain and install it prior to installing ArcGIS Engine 9.0.

Additional Software and Development Requirements

Visual Studio .NET 2003 and the .Net Framework 1.1 is required to use the developer controls that ship with the Engine Developer Kit.

Requirements also apply to the ESRI distributed version of ArcGIS Engine Runtime; further requirements may be specified by third party developers.

Development Environment Recommendations

The following are Integrated Development Environments (IDE) recommendations based on Engine API.

COM

- Visual Basic 6 sp3
- Visual C++ 6 sp3

.NET (1.1 Framework)

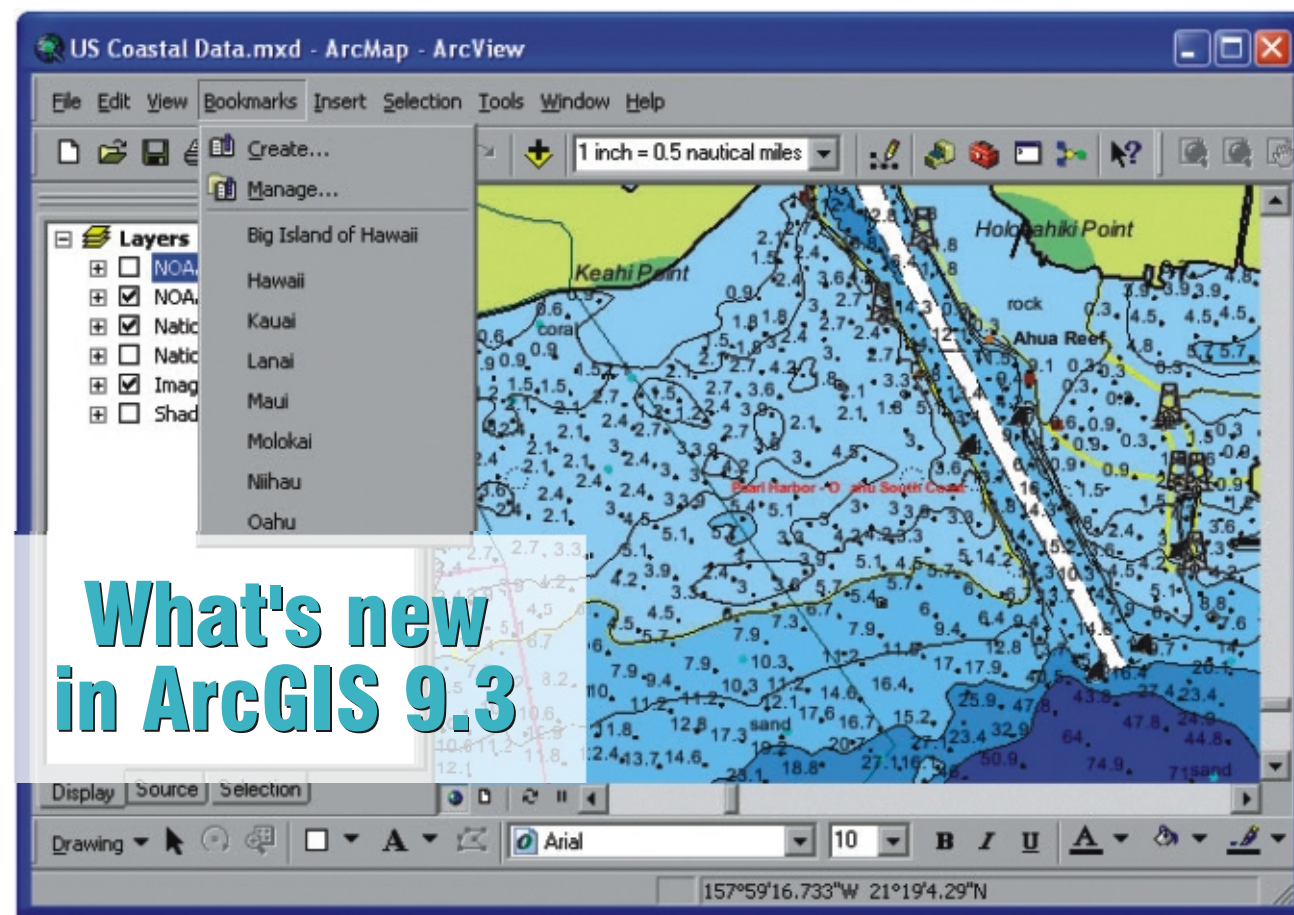
- Visual Basic .Net (Visual Studio .Net 2003)
- C# (Visual Studio .Net 2003)

JAVA

- Eclipse
- JBuilder 8
- IntelliJ

C++

Microsoft C++ Compiler



What's new in ArcGIS 9.3

ArcGIS 9.3 continues to expand the use of GIS throughout the enterprise. From GIS professionals to decision makers, clients, and the public, GIS information and analysis can be made available wherever it is needed.

ArcGIS Desktop at 9.3 will improve in three areas: mapping, editing and geoprocessing.

Key Features

ArcMap is undergoing a number of quality improvements and enhancements for 9.3, including the following:

- New dialog lets you convert graphics drawn on your map into shapefiles or feature classes, making it easy to quickly create study areas, clipping extents, simple datasets, etc., without going to ArcCatalog.
- Ability to reorder and sort bookmarks, and export them for import into other maps.
- Symbols in legend on the map and in the Table of Contents are automatically drawn with a lighter color if you make the layer partially transparent, so they look more like the actual symbols drawn on the map.
- The Window Viewer command has been enhanced so that you can use viewer windows to view multiple data frames side by side. This is especially useful with dual monitor

configurations. (This enhancement is also included in ArcGIS 9.2 Service Pack 2.)

- With ArcGIS 9.2 you can enter scale in relative format (e.g., 1 inch = 100 miles). ArcGIS 9.3 adds the ability for ArcMap to report scales in relative format.
- Pause Labeling button lets you temporarily turn off all labeling while you work on the map.
- Easier to create temporal animations in ArcMap with new Create Time Layer Animation command.
- Better handling of field aliases and other properties, etc. after joining data.
- At ArcGIS 9.3, using the Zoom To Layer command on a selection layer or layer containing a definition query will take you to the extent of the actual subset of features represented by that layer, not the full extent of the data source.
- Built-in support for the various basemaps provided in ArcGIS Online.
- Better support for OGC standards including support for OGC WMS 1.3 and support for OGC-WCS. You can now navigate down into WMS services inside the Add Data dialog and ArcCatalog to access the different layers they contain.
- Cartographic representations, introduced in 9.2, are improved to provide WYSIWYG feedback for editing operations, new

tool for marker symbol displacement, improved geometric effects, and better performance.

- Labeling enhancements include new contour labeling options for complex maps such as geology, street address labeling, new polygon placement options, support for Asian language vertical text placement, and the ability to automatically place text within various parts of a polygon (i.e., offset from center, in a corner, etc.).
- Reselect command in table window makes it easier to refine a selection.
- At ArcGIS 9.3, the Export Raster Data dialog lets you use the selected graphic(s) on the map to define the clipping extent, including the use of irregular shapes. The Clip geoprocessing tool will let you use the extent of layers in your map and their selected features to define the clipping extent.
- User interface for interactively rematching geocoding result layers has been improved.

Editing

ArcGIS 9.3 will resolve a number of quality issues affecting our users while editing in ArcMap. A major effort has been developed to find and fix bugs and make enhancements based on user input. In addition, ArcGIS 9.3 will support additional methods for creating and editing z value information in ArcGIS.

Geoprocessing

ArcMap is undergoing a number of quality improvements and enhancements for 9.3, including the following:

- Better organization and descriptions for error messages. Messages will be tied to the ArcGIS Desktop help system or they will be in the Software Developer Kit (SDK) help. They will contain a description of the problem and a solution.
- Progress bars where appropriate will be added. For tools that are iterative in nature or contain multiple steps, more informative messages will be available to indicate the current stage of processing.
- Several key tools including Near, Summary Statistics, Combine, Fill, and Buffer have been enhanced to improve performance and expanded capabilities.
- The framework for building models and Python scripts will include more options for parameters, such as filters for input values and custom validation logic.
- Support for native Python types including lists and booleans as input or return values for geoprocessing methods and properties.

- New spatial statistics tools have been added to support regression analysis including Geographically Weighted Regression and Ordinary Least Squares Regression. Existing spatial statistics tools have also been improved including increased performance in ModelBuilder.

Standards and Interoperability

ArcGIS 9.3 will allow users to directly publish ArcGIS services into the Microsoft Virtual Earth and Google Earth environments and facilitate access to ArcGIS services from these applications.

ArcGIS Server

We are focusing on the following key areas for ArcGIS Server 9.3:

- **Image services** - A new image service will be optimized for image delivery. It will support resampling/compression as requested by the client, as well as delivery both pictures and data. In addition, you will be able to publish raster data that is stored in any geodatabase or file system. We will also offer ArcGIS Image Server as an extension for people who need to publish large collections of file based imagery. This open service will support SOAP XML, WCS, and WMS

- **Scalability** - ArcGIS Server will support on-demand caching of 2D map services. Via the ArcGIS Server Manager, you will be

able to define the cache for a service and enable on-demand caching. You will also be able to use ArcCatalog to build the cache for an area of interest and modify a cache to include additional scale levels.

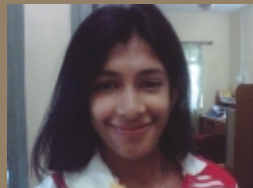
- **Security** - With the release of ArcGIS Server 9.3, you will be able to manage security using ArcGIS Server Manager. Examples of new capabilities include managing the list of valid users for your Web GIS and authorized users to use specific applications and services. GIS Web services can be encrypted as needed.

- **Usability** - At 9.3, we will be making a number of enhancements to the Web mapping applications. These enhancements include creating a more streamlined user experience, new map navigation, and more tools. We will also support map tips on results and additional printing capabilities.

- **Accessibility to Web Developers** - ArcGIS Server will include a JavaScript API for mashup-style development. It will also include Web services SDKs for SOAP and REST services, as well as AJAX-enabled Web ADFs for advanced Web and enterprise applications. Major additions are planned for the documentation, particularly for the Web ADF, JavaScript SDK, REST API, and SOAP Web services.



Logistics Cost Optimization-GIS based Warehouse Location & Route identification



Yestha Bapna
Arcgis network analyst

Logistics is a process of moving goods from a manufacturer to a customer in the most timely and cost-efficient manner possible. It involves the integration of information, transportation, inventory, warehousing, material handling and packaging. The objective of logistics is to systematically and strategically coordinate the functional groups and tactics across the company for the purpose of improving the total flow of materials from suppliers to end users.

In order to have effective logistics management the mapping of inventory/material/goods is done in GIS. GIS plays a major role in optimized route planning, network mapping and warehouse management in order to minimize cost and time.

The paper describes the utilization of mapped GIS network for warehouse analysis, route analysis and cost optimization which helps us to identify areas of opportunity and growth for our business for providing a higher level of service to our customers.

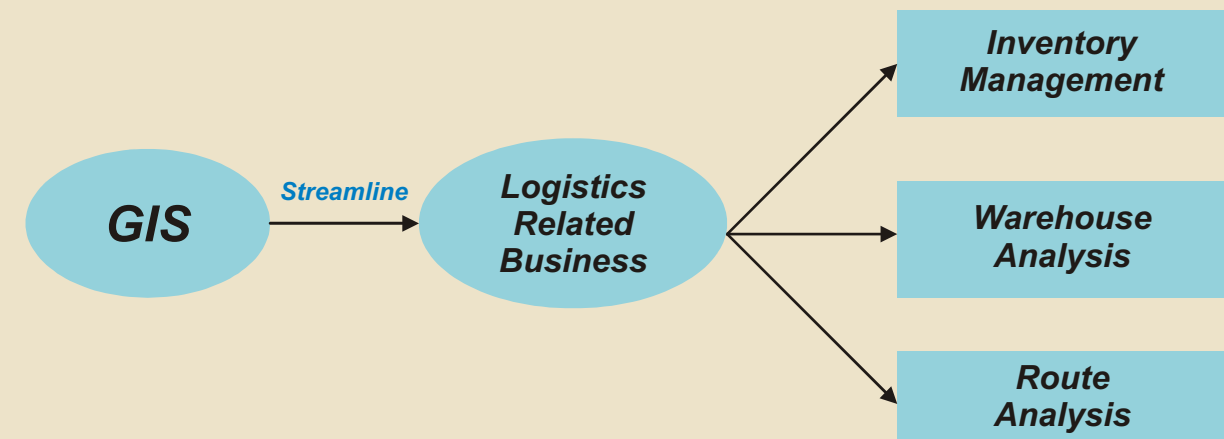
Introduction

Previously when GIS mapping was not much in use, the transportation of inventories/goods was done through some predefined routes without due consideration of traffic, fuel consumption, distance etc. These routes were not justified in the sense of cost, distance as well as time.

GIS plays a key role in improving the present system by streamlining logistics related business process like inventory management, warehouse analysis and route cost optimization which help us to save costs, eliminate inefficiencies and increase the revenue.

Logistics can streamline the flow of goods, meet the demand requirements and provide the best service possible which in turn improves the business operations across an enterprise. Maximum advantage could be reaped when logistics is coupled with GIS capabilities.

The basic role of GIS in logistics in a pictorial format can be shown as:



Methodology

The management of logistics operation in any company that services a large geographical area can easily become a very complex task. The task can be simplified by applying GIS systems which is mainly required for route analysis and warehouse analysis.

For RCOM expansion which at a broader level includes 18 telecom circles, has 41,000 sites which needs to be up and running to serve the customers at its earliest. The inventories/ equipments required for these sites are imported from abroad via sea transport. There are four major sea ports in India where landing is done. These goods are then transported to various national warehouses across the country and then migrated to around 40 other nearest regional warehouses. Finally they are routed to the sites where they are to be installed. For transportation of these equipments the route mapping and warehouse mapping is done in GIS in order to provide a higher level of service to the customers with optimum resource utilization.

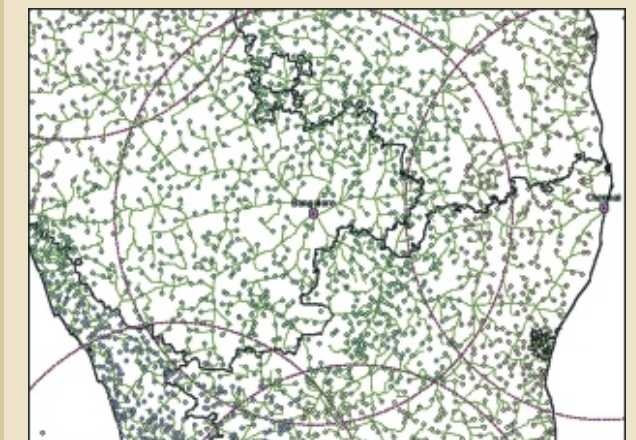
Route analysis

The route analysis basically aims to minimize the cost of travel from one location to another for the transportation of goods in terms of trips required involving the combination of time and distance. The route is analyzed in such a way that not only the destination but even the driving direction as well a map is provided that includes the route details having the important landmarks. The route should be planned in such a way that it takes minimum time with fewer obstacles, less traffic, and minimum fuel consumption.

A customized tool named as "ROUTE LOCATOR" is developed for mapping the most justified route in terms of time and distance. The lat long values of the origin and final destination is provided as the input which returns the most efficient route that any vehicle should take based on the inventory and load its carrying.

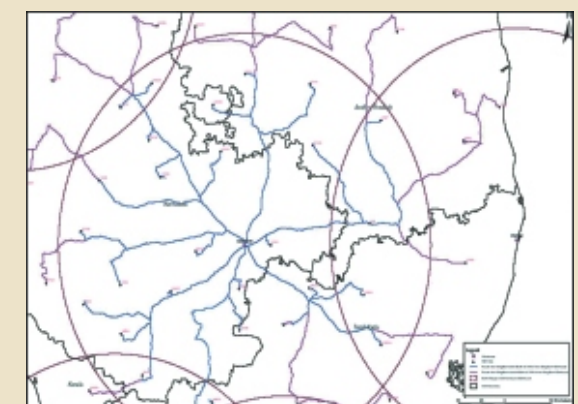
Usually national highways are preferred but if a shorter route which consumes less time and cost, minimum obstacles like river, hilly area etc and less traffic is available then the vehicle is routed through that path.

Routes from the warehouses to sites are mapped as shown:



The prioritization of transport is done by if there is a single origin and multiple destinations. Based on the combination of multiple target locations an optimum route is decided.

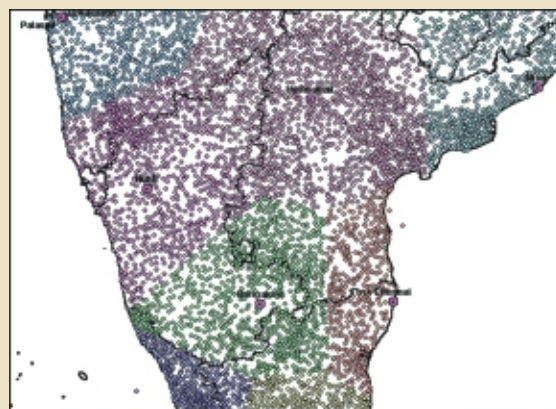
Routes falling within a buffer of 200 km are mapped as shown



Warehouse analysis

We have done the analysis for warehouses which mainly requires mapping the warehouses at a suitable distance of 300 km from the distribution site. A distance matrix is prepared for the warehouses versus the sites to be served in terms of distance between them. Distance matrix is required to analyze which all sites can be served from the nearest warehouse in terms of cost, time and distance.

Warehouse gap analysis is done in order to map the distribution sites which are at a distance more than 300 km from any warehouse. Important towns best suited in the gap area are identified and selected based on the distribution pattern.



Sites falling within 200km around the warehouses mapped in South India:

Thus cost optimization can be condensed from the above as follows:

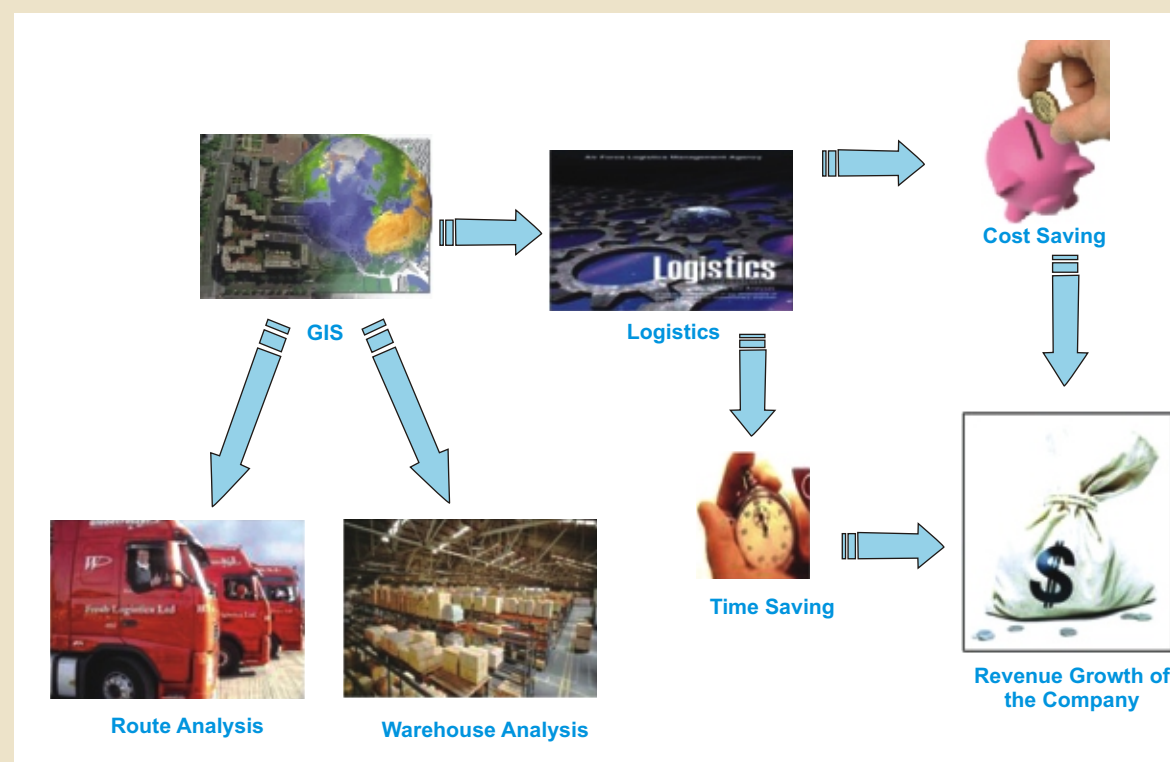
- Planning logistics for higher efficiency and effectiveness
- Time saved due to optimization of routes
- Down time reduced due to prioritization of sites
- Reduction in cost by combining multiple destinations.
- Appropriate site selection for warehouses thereby reducing repetitive transport costs.

Conclusion

GIS based logistics system in our company greatly helps us in cost saving, timely distribution of inventories and control of activities there by providing a cost effective delivery to customers and higher revenue.

The distance matrix, warehouse gap analysis, route mapping play a major role in analyzing the planning, execution and control of the inventory flow required for the revenue growth of any business.

GIS brings out the inherent potential of the geography by streamlining the logistics related business for improving operations across our enterprise and increasing all of our execution solutions to meet the demand requirements and provide our customers with the best service possible.



ESRI India User Conference 2008 Report

A unique opportunity for the GIS user community to interact and disseminate information was the 9th ESRI India User Conference that was held during 22-23 January 2008 at Radisson MBD Hotel, Noida, in the National Capital Region, Delhi, India. The User Conference offered a wealth of information regarding software and technology from ESRI Inc (USA), ESRI India, exhibitors and business partners.

The aim of this conference was to bring together ESRI users for sharing knowledge on geospatial data, applications and software. The basic theme of the User Conference was Geo-enabling Communities. India with its vast diversity in terms of geography, culture, economic development provides an opportunity to understand and implement GIS in day to day activity and in every community. With rapidly changing economy of the country, especially globalization being supported with rapid development and transmission using the geospatial information and knowledge share; the User Conference aimed at discussing the aspects involved in Geo-enabling Communities in the country.

The 9th ESRI India User Conference was officially opened and welcomed by Mr. Rajesh C. Mathur, President ESRI India, addressing the GIS professionals attending from nationwide that ESRI India User Conference would abide by its commitment to bring to the attendees the latest technological development and applications on GIS. Further addressing he mentioned the world today is facing several challenges that include climate change, population explosion and depletion of natural resources. Government and NGOs world over are constantly in search of innovative solutions, to build the wherewithal to tackle these challenges and to provide sustainable and better living. Though GIS cannot directly give solutions, it can arm governments to deal better with these challenges.

Addressing the inaugural function Dr. Manosi Lahiri, CEO, ML Infomap, shared her experience how GIS has been extensively used to discover the actual course of river Sutlej, a major tributary of river Indus in the field area of Himalayan ranges in Lhasa in Tibet. She mentioned that the evidence of climatic change in the last 100 years and present resources of Sutlej is a bench mark in applied sciences and use of ESRI ArcGIS technology.

The User Conference was inaugurated by Dr. Prithvish Nag, Director NATMO, with an inspiring speech mentioning that the Conference theme "Geo-enabling Communities" as it suggests that it has an important role to play in improving the quality of life of the mankind and understanding the potential of the technology being utilized optimally. He also briefed on how NATMO has been using ESRI technology and earned the top honours (SAG award) for the use of ESRI GIS technology from ESRI Inc.

Our special guests from ESRI Inc. USA Mr. Dave Byers and Mr. Damian Spangrud shared their views on GIS technology developments in rapidly changing communities today. Addressing the gathering Mr. Dave Byers declared that the framework the world need is of greater knowledge and awareness, comprehensive planning ability to look at multiple scenarios, efficiency and sustainability, conservation of nature and collaborative action to overcome the challenges of the world. He also showed confidence that ESRI technology will register growth in the coming years. Leading the technology session Mr. Damian Spangrud introduced the new advancement features of Arc GIS. He also extended his presentation to different areas like CAD support, editing tools and COGO tools, cartographic symbols and rules etc. He also spoke on the usability of GIS in cartography which is a blend of art and science.



ESRI India
GIS and Mapping Solutions



AUGUST GATHERING @ 9th ESRI INDIA
USER CONFERENCE 2008



The User Conference was aimed at entire GIS user community who are extensively using ESRI technology in their organizations and implementing GIS in large scale. The User Conference also gave an opportunity to interact and focus on the user community to understand their problems and solve their solutions. The User Conference showcased various technology and application oriented presentations keeping in mind the ESRI user community of the region. The User Conference witnessed participation both



from government and private organisations like Ministry of Urban Development, National Informatics Centre, NATMO, Survey of India, Forest Survey of India, Indian Space Research Organisation, Reliance Communications, Reliance Energy, Tata Consultancy Services, etc.

ESRI India always believed in the vision of moving ahead the geospatial technology for the development of the mankind. Keeping this vision alive we had Microsoft and IBM as Platinum Sponsors and Digital Globe, HP, Nvidia and Trimble as Gold Sponsors, who participated along with ESRI India showcasing the cutting edge development in the geospatial domain. The User Conference was attended by almost 700 delegates nation wide and the exhibitors included Microsoft, IBM, Digital Globe, HP, Trimble, GIS development, etc. Stating the art of exhibition as a large single family of GIS users, exhibitors had an opportunity to display their hardware, software, datasets, data services, application products and GIS information to the user community.

Along with the plenary session User Conference also had the technical sessions on the technology, GIS applications and poster session. These technical sessions featured ESRI GIS technology being used by the varied communities in the Indian subcontinent focusing on the major GIS applications. The Best Paper and Poster Awards were honored to the GIS professionals using ESRI GIS technology.

The first Best Paper award was given to Ms. Yestha Bapna from Reliance Communications for "Logistics cost optimization GIS based warehouse location to route identification" ; second Best Paper award Mr. Pradeep Thomas from Reliance Energy Ltd. for "GIS Based Outage Management System An Integrated Approach" ; third Best Paper award went to Dr. Alagarsahy Jeyram, Head, RRSSC Kharagpur for "Cadastral Resource Management Using Geographic Information System".

The first Best Poster award was bagged by Directorate General of Hydrocarbons, Noida; second - Andhra Pradesh Forest department, Hyderabad; and third - National Atlas Thematic Mapping Organisation (NATMO), Kolkata.

The 9th ESRI India User Conference concluded with a panel discussion which was chaired and moderated by Mr. Rajesh C. Mathur, President - ESRI India, and the panelist were Mr. M Rajamani, Joint Secretary, Ministry of Urban Development; Dr. Shiv Kumar, Head NSDI; Dr. Mahesh Chandra, NIC HQ; Dr. J R. Sharma, Head RRSSC Jodhpur and Dr (Mrs) Aruna Srivastava, Malaria Research Centre, New Delhi. The panel discussion debated on the conference theme "Geo-enabling Communities" and highlighted the recommendations to the government. These recommendations included the need to integrate the GIS technology in the initial planning process and be a part of the e-governance initiative of government of India; Need for awareness of GIS technology through all the possible medium and benefits to the stakeholders; To encourage the Public-Private Partnership in various government initiated projects such as NSDI, Jawaharlal Nehru Urban Renewal Mission, NUIS etc. to name a few; Use of technology in the varied community segments for the betterment of the society.

With this note the 9th ESRI India User Conference ended with President - ESRI India thanking all the participants and Sponsors, hoping to meet them once again with the latest technology/application developments in GIS, the next year at the 10th ESRI India User Conference in January 2009.



Arc Hydro Database for Enterprise Water Information System: The Difference between Enterprise and Model Databases Explained

- Sreeresh Sreedhar, ESRI, Redlands, California

Introduction

ESRI's commitment to the water resources community took a big leap in 2002 with the release of the Arc Hydro data model. This data model was developed by the Consortium for GIS in Water Resources with inputs from key contributors from government, industry, and academia. Since then, many water resources agencies are using Arc Hydro as an enterprise GIS

closely tied to the problem being solved. But this close coupling tends to diminish the utility of the database from being truly enterprise and serving the needs of many stakeholders in the enterprise. This article will try to explain some of the nuances and issues and steer the reader toward clearing the misconceptions about Arc Hydro and model-specific databases (Hydrologic Engineering Center-Hydrologic Modeling

collection methods produce a variety of data formats that need to be integrated into a single system from which many clients/users can derive information and to which many clients/users can write information. The goal is to have a single database for many users with their own distinct uses of the same data.

For example, a gauging station is a basic inventory in a water system that takes on many roles within an organization. The location and attributes of a gauging station can be collected in many ways. The time series information of the stream flow is also collected and stored in many platforms and formats. But the use of this information depends on the user's requirements. For cartographers, stream gauges are an important base layer. For hydrologists, a stream gauge can represent the outlet of a watershed that they are delineating and modeling. It can also become a junction in a network of rivers and confluences. The same point becomes a junction in a model schema. Multiple users of this data, together with multiple data input, retrieval, and query requirements, make it essential for it to be stored in an enterprise. If you are collecting the data using a mobile device or GPS, you may be tempted to store it as ASCII files or XML files with coordinate values and other attributes. If you already have everything stored in a certain format (e.g., shapefiles or CAD files), you may want to reduce the extra work of moving everything to an enterprise database. But the potential for multiple uses of water features and their inventory calls for something central and open.

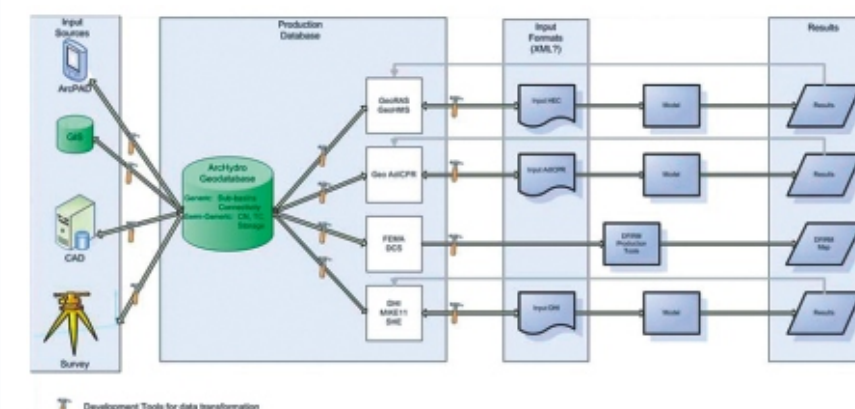


Figure 1.0: Enterprise Database for Water Resources (Courtesy: Southwest Florida Water Management District)

database. Arc Hydro tools were developed following the data model and are widely used in the water resources community for developing modeling frameworks. The Arc Hydro Groundwater data model was released later, and Arc Hydro Groundwater tools are being developed to support groundwater modeling. Over the years, Arc Hydro has matured into an enterprise framework for water information systems, and has become a de facto standard for storing, analyzing, and modeling water resource data in a collaborative way within a GIS environment.

It is evident in many instances that the hydrologists often tend to overlook broader enterprise needs when designing a database for water systems. They tend to focus too much on the model that they will eventually have to run to solve hydrologic and hydraulic problems. From the face of it, this approach looks valid, since this is very

System [HEC-HMS], Hydrologic Engineering Center-River Analysis System [HEC-RAS], MODular three-dimensional finite-difference ground-water FLOW model [MODFLOW], Soil and Water Assessment Tool [SWAT] MIKE SHE, Interconnected Channel and Pond Routing Model [ICPR] etc.).

Enterprise Database for Water

Figure 1.0 shows a typical dataflow in a water organization. The various data



Figure 2.0: Many Roles of Stream Gauges in a Water System

Water Resources Domain

There are many aspects of a water resources domain; however, a vast majority of the water resources problems fall into three broad categories. Figure 3.0 shows the overlapping ellipses that represent hydrology, hydraulics, and watershed management. Modelers are focused on hydrology (rainfall/runoff) and hydraulics (floodplains), while watershed managers are focused on integrated watershed management efforts (water balance, soil erosion, water quality, land use improvements, etc.). While all of these people are working in their own domains, they create and maintain spatial and temporal data in varied formats and scales. This not only creates duplicated efforts and data but also hinders an organization's attempt to achieve a common data pool

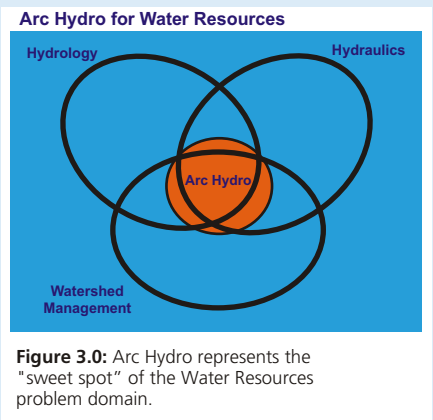


Figure 3.0: Arc Hydro represents the "sweet spot" of the Water Resources problem domain.

that is centrally maintained and available to serve a variety of audiences at the same time. So what was done, and is being done, to address this malaise? The short answer is Arc Hydro. I know that short answer won't help if you have a mandate to develop the specifics of a water information system for your organization or your country. I will break this article into three broader

domains of water resources and give examples of real, and successful, applications of Arc Hydro in these domains. If you have organizational requirements beyond what can be handled by Arc Hydro, extending Arc Hydro to accommodate specific organizational needs is an easy and inexpensive effort compared to undertaking an expensive database design from the ground up. The base work is done by collaborators, and you might be able to take advantage of many man-years' worth of groundwork done by hydrologists and GIS practitioners. I will not go into the detail of the Arc Hydro data model since it is beyond the scope of this article. Figure 4.0 shows the Arc Hydro framework data model for handling surface and groundwater components. For detailed definitions of the complete data models (Arc Hydro and Groundwater), please refer to the following link: <http://support.esri.com/index.cfm?fa=downloads.dataModels.gateway>

Arc Hydro for Hydrology

While there are many programs to model surface water hydrology, HEC-HMS, from the U.S. Army Corps of Engineers, is one of the most widely used hydrologic modeling software programs. HEC-HMS is a semidistributed model designed to simulate the precipitation-runoff processes of dendritic watershed systems. HEC-HMS has a model database and file definitions to store the model elements. These are not GIS-based definitions but are mostly binary and text files forming the core of the model run. Figure 5.0 shows watershed boundary and stream line features are both defined in the same file, which is in plain ASCII format. Each feature type is contained in a separate section of the file. Each section begins with the keyword "MapGeo," followed by a

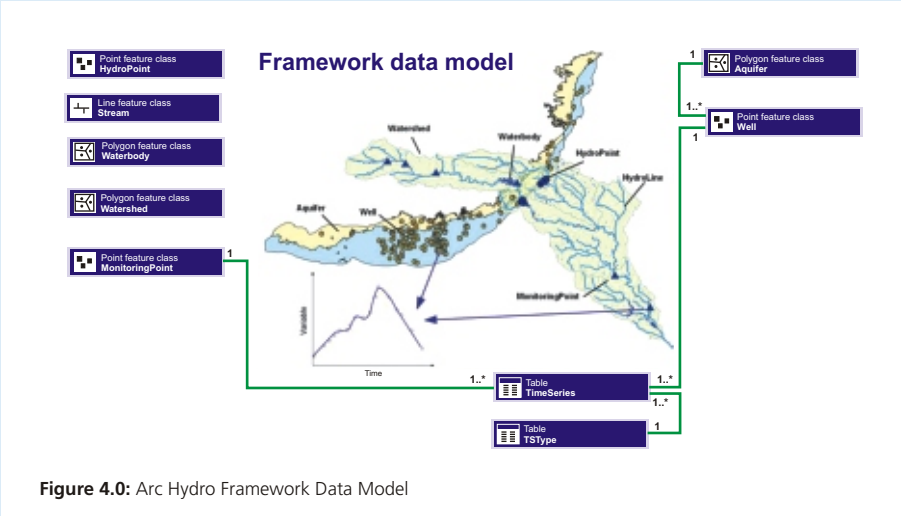


Figure 4.0: Arc Hydro Framework Data Model

MapGeo: BoundaryMap

MapSegment: closed

582242.875000, 4174922.500000
582220.875000, 4174961.500000
582205.625000, 4175013.750000
581981.000000, 4174672.750000
582025.812500, 4174696.250000
582068.812500, 4174711.000000

MapSegment: closed

582810.125000, 4174024.500000
582874.687500, 4173973.750000
582950.687500, 4173902.750000
582554.000000, 4174000.250000
582667.687500, 4174003.750000
582810.125000, 4174024.500000

MapGeo: RiverMap

MapSegment: open

582750.187500, 4176706.000000
582687.000000, 4176594.000000
582657.375000, 4176468.500000
582613.125000, 4176359.500000
582482.125000, 4174521.500000
582555.250000, 4174377.500000
582555.250000, 4174378.000000

MapSegment: open

582941.500000, 4175098.500000
582920.500000, 4175009.750000
582912.312500, 4174956.500000
582699.375000, 4174540.500000
582618.250000, 4174468.250000

Figure 5.0: Sample Background Map File in HMS

colon and either "BoundaryMap" or "RiverMap." This works great for the individual model in question (i.e., HEC-HMS), but imagine this file being part of an enterprise database from which a cartographer needs to print the basin boundary maps.

Similarly, Table 1.0 shows a typical grid-cell parameter definition for Mod-Clark transformation. The coordinate system of x-coordinates and y-coordinates used in the file must match the coordinate system used in the gridded data storage system (DSS) records. Typically, the coordinate system will be either a hydrologic rainfall analysis project (HRAP) or standard hydrologic grid (SHG). Now imagine a hydrologist putting this information together without the help of GIS. I intentionally included the lengthy description (metadata), restriction (domains), and units (spatial reference) of the parameters to highlight how difficult it would be for a hydrologist to adhere to these rules without a spatial tool to help him/her.

Table 1.0: Parameter and Keyword Definitions for Grid-Cell File

HEC-GeoHMS: The U.S. Army HEC and ESRI entered into a cooperative research and development agreement (CRADA) in the late 1990s to develop a GIS interface to

Keyword	Definition	Units
Xcoord	x-coordinate of the southwest corner of the cell	integer value
Ycoord	y-coordinate of the southwest corner of the cell	Integer value
TravelLength	travel time index from the cell to the subbasin outlet	kilometers
Area	area of cell within the subbasin	square kilometers

Table 1.0: Parameter and Keyword Definitions for Grid-Cell File

HMS to simplify the model input generation within a user-friendly GIS platform. The objective was to develop a GIS-based tool to help hydrologists put together spatially relevant data into a format HMS can readily use, thereby reducing the amount of preprocessing time required before running the model. HEC-GeoHMS is built on top of the Arc Hydro data model to prepare and edit model elements and attributes within a GIS environment and export to HEC-HMS. Below is the picture of the HEC-GeoHMS data model schema (Figure 6.0) from which the HMS models are exported. The same data model forms the basis for importing

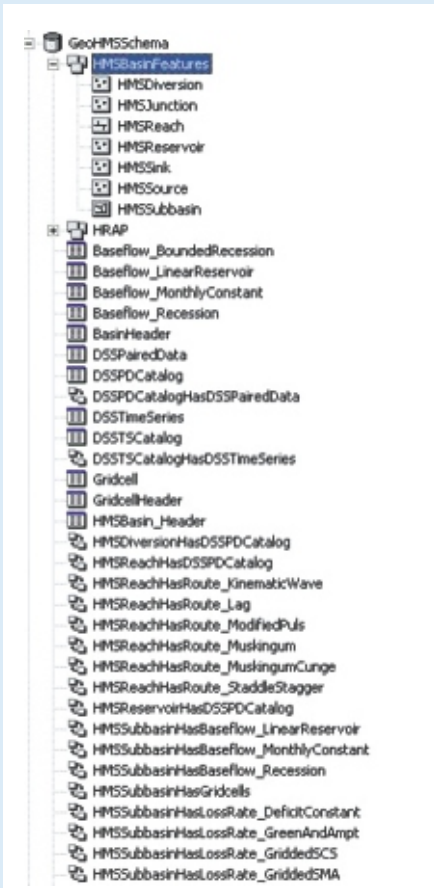


Figure 6.0: Partial View of HEC-GeoHMS Data Model Schema based on Arc Hydro

HMS models into GIS for further editing and processing.

Arc Hydro for Hydraulics

HEC-RAS is a computer program that models the hydraulics of water flow through natural rivers and other channels. The story of HEC-GeoRAS's genesis is very similar to that of GeoHMS, with the need to have GIS-based tools to prepare and package spatially relevant information (cross sections, cut lines, etc.) for the RAS model to run. HEC-GeoRAS is also built on top of Arc Hydro, and its data model extends the core data model.

Arc Hydro for Integrated Watershed Management

Watershed managers need to visualize, analyze, and report various inventories in a water system. They rely on accurate data collection, data maintenance, and model

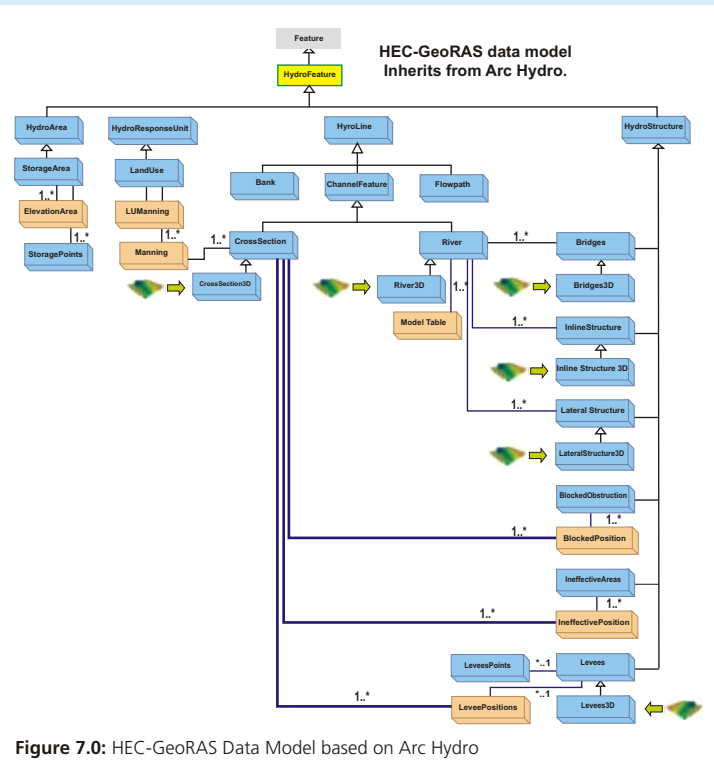


Figure 7.0: HEC-GeoRAS Data Model based on Arc Hydro

results brought back into the enterprise database. After running the models, you could expect the model results (hydrograph, floodplain maps, etc.) to be imported back into the enterprise database. From the watershed management point of view, you may still have to run other models to estimate key watershed management elements like soil erosion, excess surface water, groundwater availability, etc. You may also have to do image processing for change detection to study watershed land-use changes in fragile ecology (rapid urbanization, inadequate vegetative cover, highly erodible soil, uncontrolled runoffs, etc.). Arc Hydro provides a common repository for doing all of these.

Conclusion

Regardless of the model being used, it is important to have all these models interacting with a common database. Arc Hydro provides such a common format for everyone to read and write water information in a consistent and standardized way. The discussion of the implementation details of Arc Hydro for a specific enterprise is beyond the scope of this article, but this article outlines the framework for connecting the many dots in an enterprise (cartographers, hydrologists, watershed managers, and the general public) using a common thread. Having a single production database, as opposed to

many databases based on the model choices, is not only convenient but also reduces cost and avoids duplication significantly. So when thinking of water information system requirements, first think of the enterprise database as a whole without worrying much about the models. Focus on how the design will cater to everyone in the enterprise.

e-mail any questions or feedback to ssreedhar@esri.com.

Performance & Productivity Tips

Lock & Load Labels for Maximum Speed!

Description

This performance tip allows you to “freeze” your labels so they do not redraw when you pan or zoom in the map. This speeds up your work considerably. Labels are locked based on the current extent and are not unlocked until you click the “Lock Labels” button again.



How to Use

1. Make sure your labeling toolbar is visible (View | Toolbars | Labeling)
2. Zoom to the extent in which you want to see the labels and make sure they are visible

3. When the map has finished drawing, click the [Lock Labels] button on the labeling toolbar (as shown above)
4. You can now move around the map and your labels will not continuously redraw. Note that you will only see labels that were visible when you initially set the lock. If you pan to another area that was not visible when you initially set the lock, you won't see the labels
5. To remove the lock, click the [Lock Labels] button once again

Example of Use

You want to examine crimes in just one beat, and you need to pan around the beat to see all the crimes. By zooming into the beat and locking the street labels, you can see all the street names as you pan around without having to wait for the map to redraw each time.

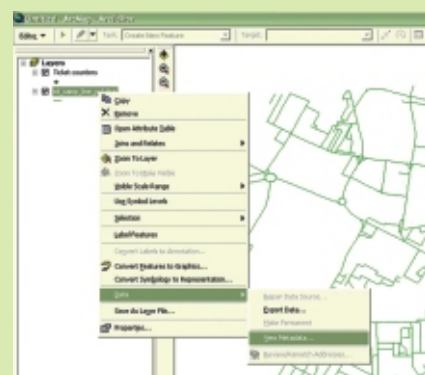
Explore metadata within ArcMap itself - No need to explore ArcCatalog for visualizing Metadata

Description

This performance & productivity tip allows you to visualize metadata within ArcMap itself.

How to Use

1. Right click on a layer in the Table of Contents and choose “Data”.
2. Click “View Metadata”



3. Metadata will be displayed in a separate window with different Stylesheet options.



Unlimited Possibilities with Definition Queries : Most underutilized highly useful functionality

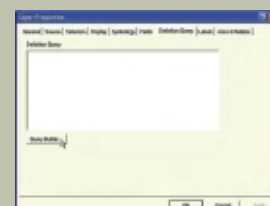
Description

This performance & productivity tip allows you to apply a SQL query to a layer, such that only features matching your criteria will be displayed. This is an immensely powerful feature that allows you to view a subset of the layer without selecting & exporting those features to a new layer each time. You can also apply dynamic SQL queries that don't have to be modified.

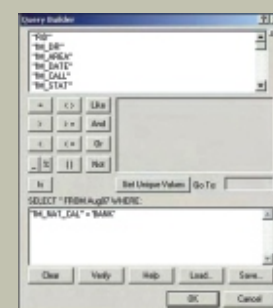
How to Use

1. Right click on a layer in the Table of Contents and choose “Properties”. You can also use Shift + Double Click.

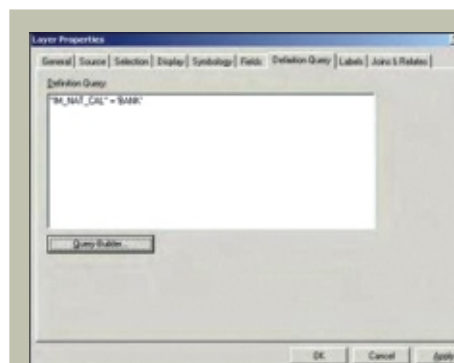
2. Go to the Definition Query tab



3. Click on the Query Builder button. This takes you to the same dialog box as if you were selecting features by attributes



4. Here, you can filter your data however you choose
5. You can also paste SQL queries directly into the definition query box (just remember you cannot verify the syntax of your query using this method)



6. Click OK, and your layer is filtered according to the query you entered

Example of Use

Definition queries are so versatile that only you can imagine the possibilities in your shop! Here are just some ideas to get you started:

You want to see each offense type (burglaries, robberies, etc) in separate layers. Bring in your source data, make copies of it, then alter the definition query of each layer to match the offense you want to view!

You want to see your residential burglaries by day of week. Do the same thing as above, but define each layer as a day of the week instead of an offense type! You could do the same thing with shifts, daytime/nighttime, etc.

You have a centerline of the whole city, but you only want to overlay two of the six police districts. Define your layer to only include these districts!

You only want to see crimes that occurred within the last week. Rather than changing your definition query every day, use a query such as “[DateField] >= Date()-7”. This query may vary depending on the format of your source data, but the idea is to use a dynamic query that always pulls the last 7 days of data.

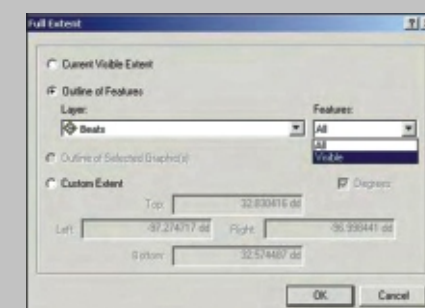
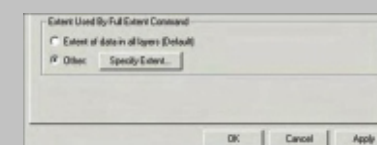
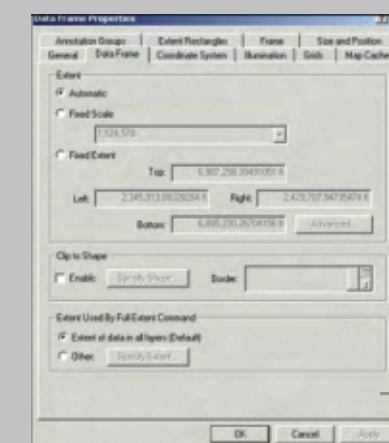
Choose your own Extent (9.2 only)

Description

This productivity tip allows you to define the limit of the “full extent” feature of ArcMap. This is the extent you would see when using the globe icon. It achieves the same effect as if you created a spatial bookmark, but for people who tend to use the globe often, this tip might be a better solution.

How to Use

1. Go to (View | Data Frame Properties)
2. Go to the Data Frame tab and see the section at the bottom
3. Choose “other”, and click the “specify extent” button
4. Here, you have several options. You can choose to use the current extent, you can select an existing layer (and choose all or only visible features from that layer), or you can manually enter a custom extent.
5. Now, whenever you want to view the “full extent”, it will represent your custom setting rather than the default ArcMap setting.



Example of Use

You have a layer of states, as well as all the districts in each state. You want the “full extent” to be Delhi, not the entire India.

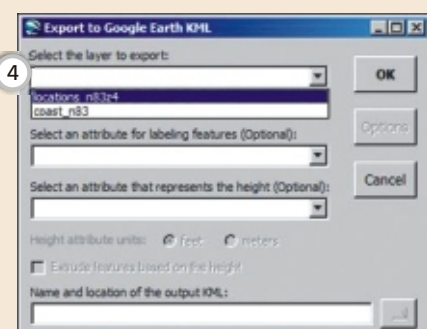
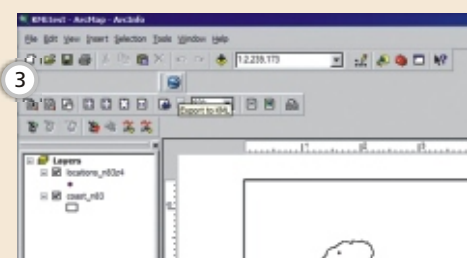
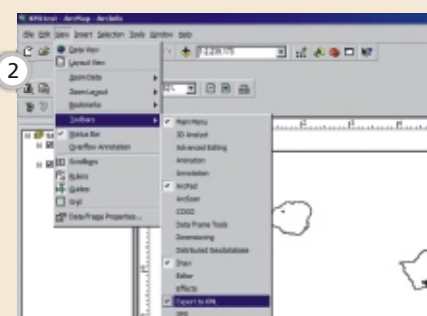
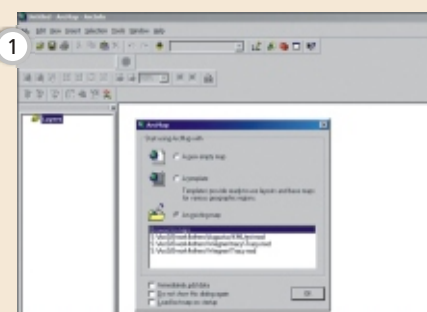
Export ArcGIS Shapefiles to Google Earth Keyhole Markup Language

Description

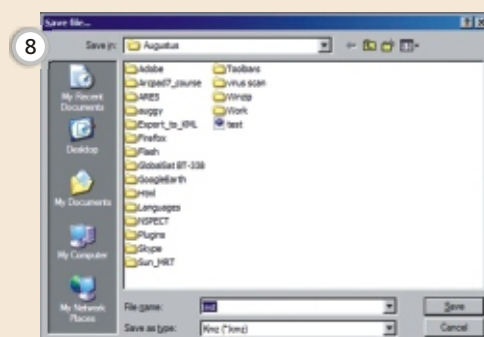
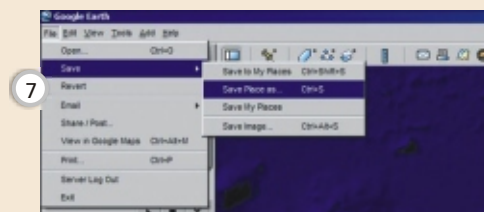
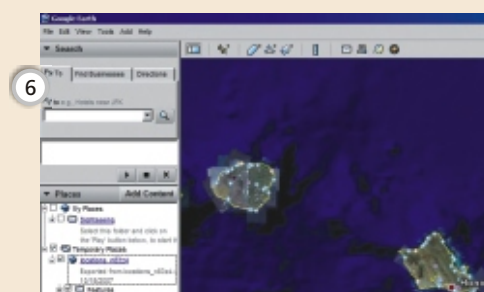
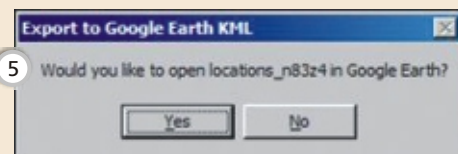
This tip allows you export any shapefile as a Keyhole Markup Language file (.kmz) into Google Earth.

How to Use

- 1) Open ArcMap. Open an existing project from which you want to use layer file.
- 2) Now turn on the "Export to KML" tool. To do that go to "View" and then click on "Toolbars" and within its drop down menu find and click on "Export to KML".
- 3) With the tool turned on you should be able to see the tool "icon" on the "toolbar"



- 4) Now with your project open, Click on the Export to KML icon and the following window should appear. Click on the "drop icon" and choose which "layer" is to be exported. Then hit "OK".
- 5) Another screen will appear which reads " Would you like to open locations_n83z4 in Google Earth?" Click the "Yes" button.
- 6) Google Earth should open and zoom to the "layer" you have chosen.
- 7) To save simply click on "File" choose "Save Places as" and choose the location you want to save it to.
- 8) Hit "Save" and you are done. Congratulations you have successfully exported a shapefile as a Keyhole Markup Language file (.kmz) into Google Earth.



In Conversation with Dr. R. R Navalgund Director, SAC



The mandate of ISRO is to utilize the knowledge of space and space technology to address the grassroots problems of the society like health, education, natural resource information, meteorology and disaster management. How is SAC contributing to this mandate?

Space Applications Centre (SAC), a major Centre of the Indian Space Research Organisation (ISRO) is fully engaged in activities towards realizing ISRO's vision of "Space Applications towards Societal Benefits". It designs and develops a host of satellite communication systems, remote sensing sensors operating in both optical and microwave regions, development of data processing systems and formulation and execution of a large number of application programmes at national level to meet this goal. Both remote sensing and communication application programmes address many areas of societal benefits, such as sustainable increase in agricultural production, water security, human health, education, infrastructure development; disaster monitoring and mitigation, climate change impact analysis, improved weather forecasting and protection of ecosystems and biodiversity. Some of the activities which directly impact the life of people at grassroots level include watershed development; identification of potential drinking water sites; potential fishing zone forecast; tele-education; tele-medicine etc. More recently, through the concept of Village Resource Centres, delivery mechanism for services is being strengthened.

The future seems to belong to technologies like 3D modeling and visualization. How is SAC utilizing these technologies for developing space applications?

Availability of stereo data from space based sensors (Cartosat-1, 2005) has enabled digital elevation modeling at high resolution. This kind of 3D modeling has helped in runoff modeling, drainage networking, urban planning, coastal vulnerability analysis etc. Geovisualisation provides the theory, methods and tools for visual exploration, analysis, synthesis and presentation of geospatial data. This helps not only in urban planning but also in many other fields such as tree-growth modelling, coastal zone management, impact of sea level rise, etc. SAC is exploring these modern technologies for various cutting-edge applications.

Public private partnerships are the new mantra in every field. What is SAC's take on this? How is it furthering PPPs?

Right from its inception, SAC has emphasised on partnerships/working together. In the technology development area, SAC has worked with industries and private entrepreneurs. It has, in place, a policy frame work for Technology Transfer and Industry cooperation. Very recently SAC held an Interface Workshop for Electronics Industries to strengthen existing joint efforts and to explore further avenues. In many programmes of SAC, non-government organizations and end-stake holders are directly involved. For example, the implementation of watershed development programme was achieved through participatory approach involving NGOs and the ultimate beneficiaries. Jhabua Development Communication Project (JDCP) is an excellent example of this kind. Similarly in Village Resource Centres, NGOs are directly involved to take the benefits of space technology to the common man. In almost all application programmes, the Centre works jointly with relevant Central and State Government agencies, non-government organisations, voluntary agencies, academic agencies and the beneficiaries, thus comprising all stake holders. SAC is also working in the area of software development and tools along with relevant industries in a partnership mode.

Can you detail the current focus of activities/ applications SAC is involved developing in? What is the status of space applications in the country vis-à-vis the world?

SAC focusing not only on consolidating the activities undertaken but also on advanced technologies and enhancing the reach and delivery mechanisms of application programmes. These include, design and development of advanced communication payloads providing higher power, operating in higher frequencies, employing frequency reuse, less weight, and navigation payloads to help establish Indian Regional Navigational Satellite System. SAC also plans developing advanced earth observation sensors operating in microwave region such as SAR, Scatterometer, Radio meters, Sounders and instruments in hyperspectral domain; advanced satellites for weather and ocean state forecasting; planetary missions. In the earth observation applications areas, the stress is on climate change studies, energy and water balance; agricultural monitoring, etc. Research in improved weather forecasting, cyclone track prediction and land fall point and ocean state forecasting are other thrust areas. India has a leading position in the field of space applications. Many of our application programmes deals with much more complex situations than anywhere in the world. On the whole, India has a holistic applications programme dealing with all aspects of improving quality of human life. Indian Space programme is often cited as a model to the developing world.

What is SAC's capabilities/expertise in spatial modelling and simulation techniques? How and where these techniques are being utilized by SAC.

Since most of the EO applications involve use of spatial data (either in raster or vector format); spatial modelling and simulation are the tools used by many SAC scientists, who are experts in their own fields. These modelling and simulation tools are used in crop forecasting; energy and water flux studies; alternate cropping pattern planning; site suitability; urban planning; weather forecasting etc.

What is SAC's vision in building applications using space technology for the development of the nation?

Space Applications Centre firmly believes that space technology has an important role in nation building. The space infrastructure provides unique instruments necessary for the transformation of the society from a developing one to the developed. SAC works towards space applications, be in the area of communication, navigation, earth observation, disaster monitoring and mitigation, in getting them assimilated in the functioning of governance to help the end-stake holders and achieve better quality of life. While building applications using space technology for the development of the nation; SAC's vision is to "Enable a Food, Water and Energy secured nation, where the common man has access to basic requirements such as health, education, infrastructure and information and where the miseries caused by disasters have been lessened".

How do you think geospatial applications are evolving? What will be the future for GIS applications?

Next to Information Technology, the Geospatial technology is going to see a major development in the coming years. The technology and its applications will no more be in the hands of a few specialists. It will be used more and more by the common public. 3D GIS, Open GIS, Web-based GIS and Mobile GIS are some of the future trends of GIS. A synergy of remote sensing, communication and navigation technologies will guide the future of GIS applications.

Utilizing ArcGIS Capabilities to Map and Model Winter Fog Over the Indo-Gangetic Plain

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Among the techniques and tools capable of assisting continuous monitoring of different environmental phenomena, Remote sensing and GIS is proved to be the most spectacular in effectively keeping a close view on earth's dynamic processes. Fog in northern India is such a phenomena occurring every year over the Indo-Gangetic basin affecting normal human activities, especially road/rail traffic, aviations and also health. Smog (smoke + fog) is observed to be frequently affecting the industrial areas in the months of December to February every year. The basic requirements for fog to form are sufficient soil moisture content, high relative humidity in the air, optimum air temperature and very low wind speed. There must also be condensation nuclei or something onto which the water can condense. Condensation nuclei can be dust particles, aerosols, pollutants etc. When the air is saturated, additional moisture will condense onto this nucleus. Air cools best with clear skies as there are no clouds to trap the heat and other particulate matters floating in the atmosphere. The typical meteorological, environmental and prevailing topographic conditions and increasing pollution over the Indo-Gangetic plains are the common factors favouring the fog formation. The high concentration of aerosol content in the lower atmosphere over the study area also enhances the formation and lasting of fog. Figure 1 shows fog cover on 1 December 2004 over the entire Indo-Gangetic plains.

Multispectral imageries of NOAA-AVHRR (1km resolution) provide an excellent database for mapping and analysis of fog. Good coverages (both day time and night time) of Northern India make this datasets more suitable for the fog

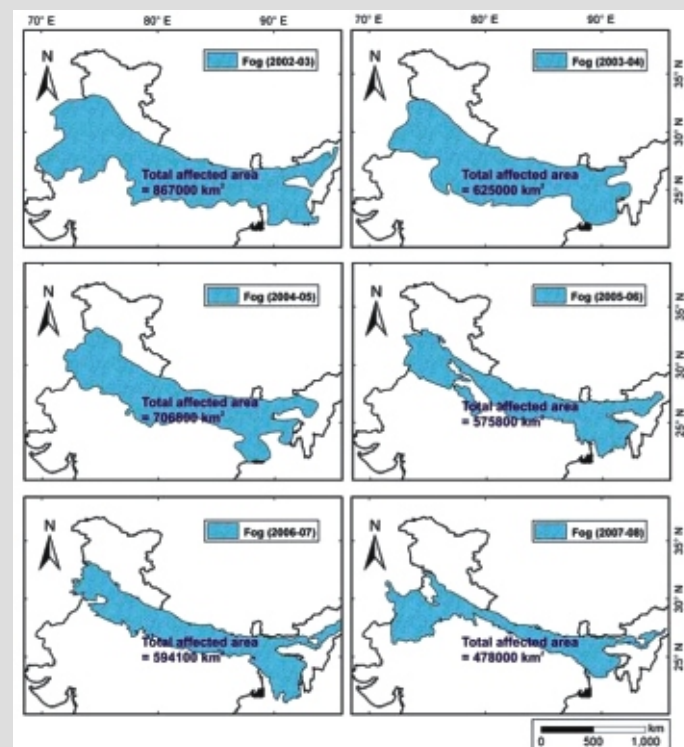


Figure 2: Variation in the total area affected by fog during the years 2002-2008.

studies. We can easily differentiate between cloud and fog cover in NOAA daytime false colour images. In night time scenes infrared channels 3 and 4 are very useful for identifying the same. The cloud-free NOAA-AVHRR images used in the present study were acquired by the Indian Institute of Technology Roorkee - Satellite Earth Station (IITR-SES). The fog affected areas of North India for the years 2002-2008 were mapped using georeferenced satellite images in Arc GIS platform by overlay technique. The calculated area (using Spatial Statistics tool) shows an interesting decreasing trend in the respective area (figure 2). The licenses of Arc GIS have been made available by IITR Computer Centre through a central server.

A classification of the fog affected area is also performed on the basis the frequency of occurrence of fog based on the analysis of last six years satellite data. The classified map was generated in Arc GIS using the interpolation technique with the help of Spatial Analyst extension. The variations in fog occurrence for different areas are shown in the figure 3. Northern part of Uttar Pradesh and Bihar is found to be the most frequently fog covered area. The frequency gradually decreases towards south. Some of the places like Gwalior, Kanpur, Lucknow, Varanashi and Allahabad etc. show a more prominent decreasing trend of fog occurrence from 2002 to 2008.

A GIS based fog forecasting model has been developed for Northern India. In this, it is necessary to ascertain the favourable topographic and meteorological conditions first for performing such prediction. For this purpose meteorological data (air temperature, relative humidity and wind speed) for 2002-2008 is also analyzed and integrated with the satellite data in Arc GIS. Elevation data is acquired from the SRTM-DEM (Space Shuttle Radar Topographic Mission Digital Elevation Model). Daily temperature, relative humidity and wind speed data collected from several stations spread over the whole Indo-Gangetic basin were used to generate surfaces for all the specific dates for which satellite data were available. The specific values of these parameters sustained within the fog-affected area are acquired to find out the favourable condition for fog formation. The meteorological and topographic optimum was found to be: Air temperature between 3-13°C, Relative humidity > 87%, Wind speed < 2m/s and Elevation < 300m. Using this condition forecasting is done in both forward and backward way with the help of Raster Calculator (in Arc GIS 9.2). The predicted fog was then verified with the NOAA images and found a close match.

In most of the cases the modeled fog was found to overestimate the observed fog towards south. The reason for this is the characteristic dissipation pattern of North Indian fog. Fog cover usually dissipates inward from its outer edges. In case of north Indian fog also the same pattern is observed. But in most of the cases it dissipates from the southern edge of the fog belt i.e. southern portion of the foggy area dissipates quicker than the northern parts. Nearer to the Himalayan foothills (acts as an orographic barrier) fog sustain for longer time during a single fog

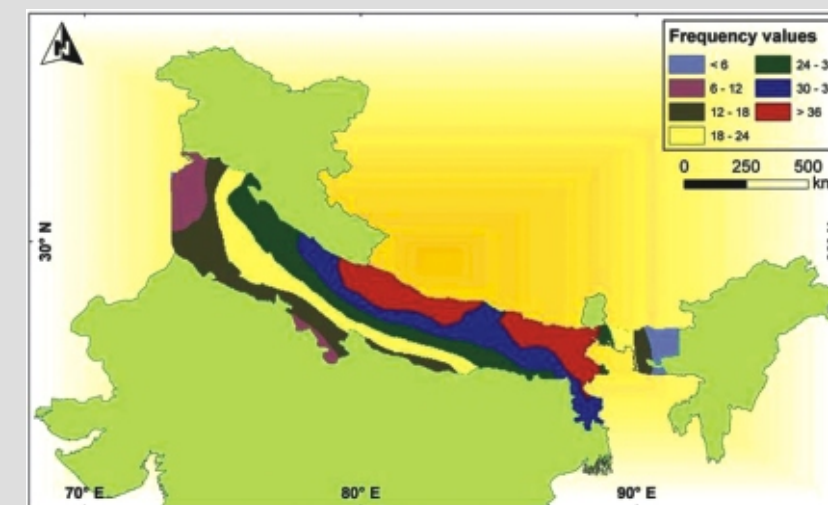


Figure 3: Map showing the classification of the fog affected belt of northern India on the basis of frequency of occurrence of fog during 2002-2008.

event. It may be noted that the modeled fog cover shows some mismatch when compared with the imageries. This is due to a time difference of about 4-5 hours between the meteorological data and the satellite data and by which time the fog already got dissipated. Based on the above study it has now become possible to make prediction of fog occurrence during winter periods, if all required meteorological parameters are available at least one day before and satellite data analysis can be performed in near real time. The meteorological websites like (<http://www.monsoondata.org/>) provides forecast of meteorological data five days in advance enabling fog prediction very much possible.

Acknowledgements: The Dean, SRIC, IITR has provided financial support to this study through a Faculty Initiative Scheme-B project.

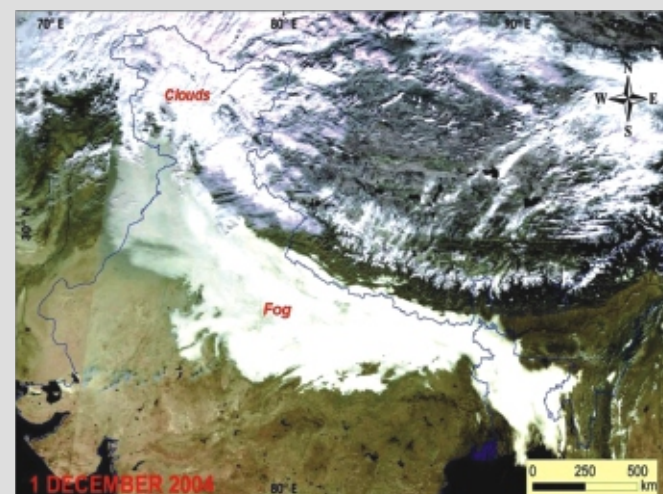


Figure 1: NOAA-AVHRR satellite image (day time FCC) collected from IITR Satellite Earth Station, showing fog cover on the entire Indo-Gangetic plains on 1 December 2004.

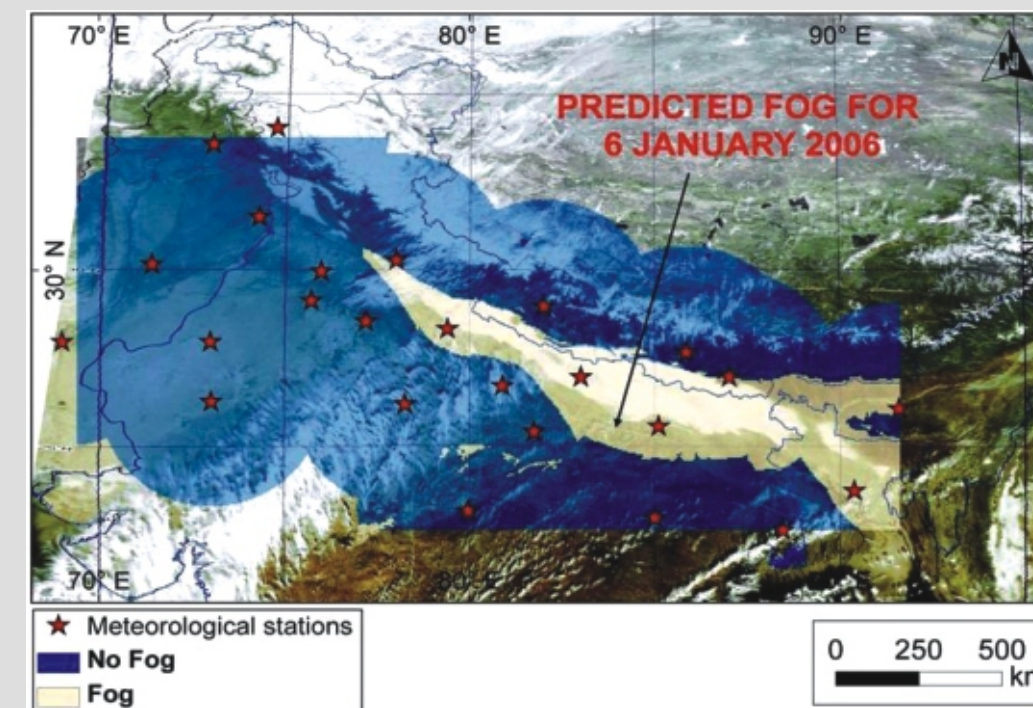


Figure 3: Map showing the predicted fog for 6 January 2006 overlaid on the NOAA-AVHRR image for the same date.

Thematic Map Rendering

Environment : Windows Xp, 2002

Version : ASP.NET 2.0, VB.NET 2005, ARCIMS 9.2 with WEB ADF

Description : The following Code snippet facilitates Thematic Map Rendering based on the Attribute(Fieldname).This procedure takes the Layer Name and the Fieldname and performs the unique value Rendering based on the field Values. The Following libraries are required to be referenced.

```
Imports ESRI.ArcGIS.ADF.IMS.Carto.Layer
Imports ESRI.ArcGIS.ADF.IMS.Display.Symbol
Imports ESRI.ArcGIS.ADF.IMS.Display.Renderer
Imports ESRI.ArcGIS.Geodatabase
Imports ESRI.ArcGIS.DataSourcesFile

CodeSnippet:

Public Sub ThematicMapRendering(ByVal lyrName As String, ByVal fldName As String)

    Dim resourceIndex As Integer
    Dim mapFunc As ESRI.ArcGIS.ADF.Web.DataSources.IMapFunctionality
    Dim mapimsfunc As ESRI.ArcGIS.ADF.Web.DataSources.IMS.MapFunctionality
    Dim mapResource As ESRI.ArcGIS.ADF.Web.DataSources.IMS.MapResource
    Dim mapResourceLocal As ESRI.ArcGIS.ADF.Web.DataSources.IMS.MapResource
    Dim mapDescription As ESRI.ArcGIS.ADF.IMS.Carto.MapView
    Dim layerDescs As ESRI.ArcGIS.ADF.IMS.Carto.Layer.LayerCollection
    Dim lNames As String() = Nothing
    Dim llds As String() = Nothing
    Dim qFunc As ESRI.ArcGIS.ADF.Web.DataSources.IQueryFunctionality
    Dim LayerIndex, LayerNameIndex, varInt As Integer=0
    Dim varString As String = Nothing
    Dim featurelyr As ESRI.ArcGIS.ADF.IMS.Carto.Layer.FeatureLayer
    Dim filter As ESRI.ArcGIS.ADF.IMS.Carto.Layer.Filter
    Dim queryParams As ESRI.ArcGIS.ADF.IMS.Carto.Layer.QueryParameters
    Dim resultstable As ESRI.ArcGIS.ADF.IMS.Carto.Layer.FeatureTable
    Dim mapView As ESRI.ArcGIS.ADF.IMS.Carto.MapView
    Dim rnd As New Random
    Dim valueMapRend As New ValueMapRenderer()
    Dim uniqueValue As UniqueValue
    Dim rowNum As Integer
    Dim valFound As Boolean
    Dim uniqueValueCollection As Collection
    Dim symbol As ESRI.ArcGIS.ADF.IMS.Display.Symbol.SimpleFillSymbol
    Dim rgbcolor As ESRI.ArcGIS.Display.RgbColor
    Dim color As System.Drawing.Color
    Dim Red, Green, Blue As Double
    Dim layer As FeatureLayer
    Dim returnstring = ""

    Try

        resourceIndex = 0

        //Get Map Functionality

        mapFunc=CType(Map1.GetFunctionality(resourceIndex), ESRI.ArcGIS.ADF.Web.DataSources.IMapFunctionality)
        mapimsfunc = CType(mapFunc, ESRI.ArcGIS.ADF.Web.DataSources.IMS.MapFunctionality)

        //Get Map Resource

        mapResource=CType(mapimsfunc.Resource, ESRI.ArcGIS.ADF.Web.DataSources.IMS.MapResource)
        mapResourceLocal = CType(mapimsfunc.Resource, ESRI.ArcGIS.ADF.Web.DataSources.IMS.MapResource)

        //Get Map Description

        mapDescription = mapfuncunc.MapView

        //Get LayerDescription

        layerDescs = mapDescription.Layer

        //Get Query Functionality

        qFunc=CType(mapResourceLocal.CreateFunctionality(GetType(ESRI.ArcGIS.ADF.Web.DataSources.IQueryFunctionality), Nothing), ESRI.ArcGIS.ADF.Web.DataSources.IQueryFunctionality)
        qFunc.GetQueryableLayers(Nothing, llds, lNames)

        //Get LayerName

        For LayerNameIndex = 0 To lNames.Length - 1
            If lNames(LayerNameIndex) = lyrName Then
                varInt = LayerNameIndex
                varString = lNames(LayerNameIndex)
                LayerIndex = LayerNameIndex
                Exit For
            End If
        Next

        //Make the Layer Visible

        layerDescs.Item(LayerIndex).Visible = True
        mapDescription.Layers.Item(LayerIndex).Visible = True

        //Get the Filter

        featurelyr = layerDescs(varInt)
        filter = New ESRI.ArcGIS.ADF.IMS.Carto.Layer.Filter
        filter.WhereExpression = ""
        queryParams = New ESRI.ArcGIS.ADF.IMS.Carto.Layer.QueryParameters(filter)
        queryParams.FeatureLimit = 100000
        queryParams.ReturnGlobalEnvelope = True

        //Get the Resulttable

        resultstable = featurelyr.Query(queryParams)
        mapView = mapfuncunc.MapView
        valueMapRend.ValueField = fldName
        symbol = New ESRI.ArcGIS.ADF.IMS.Display.Symbol.SimpleFillSymbol()
        symbol.FillType = PolygonFillType.Solid
        symbol.Color = Drawing.Color.White
        symbol.BoundaryColor = System.Drawing.Color.Orchid
        symbol.BoundaryWidth = 5
        symbol.Antialiasing = True
        uniqueValueCollection = New Collection
        If Not uniqueValueCollection.Count = 0 Then
            uniqueValueCollection.Clear()
        End If
        rnd.Next(0, 255)
        Red = 10
        Green = 100
        Blue = 1000

        //Perform Unique Value Rendering based on the FieldValues

        For rowNum = 0 To resultstable.Rows.Count - 1
            valFound = False
            If uniqueValueCollection.Contains(resultstable.Rows(rowNum).Item(fldName)) Then
                valFound = True
            End If
            If Not valFound Then
                rgbcolor = New ESRI.ArcGIS.Display.RgbColor
                rgbcolor.RGB = RGB(Red, Green, Blue)
                color = New System.Drawing.Color
                color = ESRI.ArcGIS.ADF.Web.UI.WebControls.Converter.FromapresourceGBColor(rgbcolor)
                uniqueValue = New UniqueValue()
                uniqueValue.Value = resultstable.Rows(rowNum).Item(fldName)
                uniqueValue.ComparisonMethod = ComparisonMethod.IsExact
                uniqueValue.SymbolLabel = uniqueValue.Value
                uniqueValue.Symbol = New ESRI.ArcGIS.ADF.IMS.Display.Symbol.SimpleFillSymbol(color, Drawing.Color.Black, PolygonFillType.Solid)
                valueMapRend.Values.Add(uniqueValue)
                uniqueValueCollection.Add(uniqueValue.Value, uniqueValue.Value)
                Red = rnd.Next(0, 255)
                Green = rnd.Next(0, 255)
                Blue = rnd.Next(0, 255)
            End If
        Next
        layer = mapView.Layers.FindByName(lyrName)
        layer.Renderer = valueMapRend
        Map1.Refresh()
        Toc1.Refresh()
        returnstring = Map1.CallbackResults.ToString & "^^^" & Toc1.CallbackResults.ToString()

        Catch ex As Exception
            ErrorPage.LogMessage(ex.StackTrace & "\n" & ex.Message)

        Finally
            mapfunc = Nothing
            mapimsfunc = Nothing
            mapResource = Nothing
            mapResourceLocal = Nothing
            mapDescription = Nothing
            layerDescs = Nothing
            qFunc = Nothing
            featurelyr = Nothing
            filter = Nothing
            queryParams = Nothing
            resultstable = Nothing

        End Try

    End Sub
```

Windows XP Professional 2002 Sp2

Version : ArcGIS 9.2 SP4, ArcSDE 9.2 SP4, ArcFM 9.2.1, Responder 9.2.1, .NET Framework 2.0, AJAX 1.0, C#.NET 2005.

Description : The following code snippet is used to retrieve a workspace from Responder submit rule through a Responder DataRequest by passing an attribute value. It also retrieves the feature class id of a particular feature class with given models name e.g. 'Servicepoint'. It also retrieves the feature with that attribute value being passed along with its object ID. The following Code snippet writes the necessary information/errors in the system event Log.

Usage : Can be used in a class directly as follows. But the responder DataServices should be running.

```
IDataServices dataServices = ResponderServices.GetDataServices();
DataRequest2 dataRequest = new DataRequest2(connectionoid);

using System;
using System.Collections.Generic;
using System.Configuration;
using System.Text;
using ESRI.ArcGIS.Geodatabase;
using ESRI.ArcGIS.esriSystem;
using Miner.Responder.Shared;
using Miner.Responder.Shared.Requests;
using Miner.Data.Access;
using Miner.Responder.Framework;
using Miner.Responder.Framework.Requests;
using Miner.Interop;

namespace Miner.REL.Rx.Server.Requests
{
    /// <summary>
    /// This Datarequest1 retrieves the workspace, ObjectID and FeatureClassID using connectionOID (one of the attributes in feature class) being passed
    /// </summary>
    [Serializable]
    public class DataRequest1 : IDataRequest
    {
        private bool _status;
        private int _fcid = -1;
        private int _connectionObjectID = -1;
        private int _oid = -1;
        private System.Diagnostics.EventLog _eventLog1;

        public DataRequest1(int connectionObjectID)
        {
            _connectionObjectID = connectionObjectID;
        }

        public int OID
        {
            get
            {
                return _oid;
            }
        }

        private int GetFeatureClassID(IDataServices dataServices, string modelName)
        {
            if (dataServices == null) throw new ArgumentNullException("dataServices");
            if (modelName == null) throw new ArgumentNullException("modelName");
            FindFacilityTypesRequest request = new FindFacilityTypesRequest(modelName);
            request = (FindFacilityTypesRequest) dataServices.ExecuteRequest(request);
            object key = null;

            if (request.RequestedClasses != null)
            {
                System.Collections.IEnumerator enumerator = request.RequestedClasses.Keys.GetEnumerator();
                if (enumerator.MoveNext())
                {
                    key = enumerator.Current;
                }
            }

            int fcid = System.Convert.ToInt32(key != null ? key : 0);
            return fcid;
        }

        public int FCID
        {
            get
            {
                return _fcid;
            }
        }

        public bool Status
        {
            get
            {
                return _status;
            }
        }

        public void Execute(Miner.Data.Access.DataSource source, Miner.Data.Access.DataSession session)
        {
            try
            {
                _eventLog1 = new System.Diagnostics.EventLog();
                If (!System.Diagnostics.EventLog.SourceExists("REL.Responder.DataRequest"))
                {
                    System.Diagnostics.EventLog.CreateEventSource("REL.Responder.DataRequest", "");
                }
                _eventLog1.Source = "REL.Responder.DataRequest";

                IWorkspace workspace = (IWorkspace) RxApp.GetService(typeof(IWorkspace));
                FeatureClassesRequest featClassRequest = new FeatureClassesRequest("SERVICEPOINT");
                featClassRequest.Execute(source, session);
                EnumFeatureClass enumFeatureClass = featClassRequest.FeatureClasses;
                enumFeatureClass.Reset();
                IFeatureClass featureClass = enumFeatureClass.Next();
                if (featureClass != null)
                {
                    _fcid = GetFeatureClassID(ResponderServices.GetDataServices(), "SERVICEPOINT");
                    IQueryFilter qryFilter = new QueryFilter();
                    string conOID = AppSettingsMgr.GetSettingsValue("ConnectionOIDField");
                    qryFilter.WhereClause = conOID + " = '" + _connectionObjectID + "'";

                    ICursor cursor = (ICursor) featureClass.Search(qryFilter, false);
                    IRow row = cursor.NextRow();
                    if (row != null)
                    {
                        _oid = System.Convert.ToInt32(row.get_Value(row.Fields.FindField(featureClass.OIDFieldName)));
                        _status = true;
                    }
                    else
                    {
                        _status = false;
                    }
                }
                else
                {
                    _eventLog1.WriteEntry("No featureclass found with servicepoint model name", System.Diagnostics.EventLogEntryType.Information);
                }
            }
            catch (Exception ex)
            {
                _eventLog1.WriteEntry(ex.Message, System.Diagnostics.EventLogEntryType.Information);
            }
        }
    }
}
```


ESRI India Technology Services

Software Technical Support and Educational Services

ESRI India Technology Service maintains two distinct implementation programs to support our clients: **Technical Support and Educational Services**.

ESRI India Technology Services offers a number of technical support and educational services, to help Geographic Information System (GIS) users maximise their investment in ESRI software. These programs address a range of user needs—from individual users requiring occasional answers for their software questions to organisations needing assistance in planning and implementing an enterprise GIS solution.

All ESRI India Technology Services are designed to meet the needs of our diverse user community and to assist customers in successfully achieving their GIS goals. ESRI India's service teams have a broad range of experience to offer you the most efficient technical support, implementation solution or educational services.

ESRI India Technical Support help users every step of the way in using ESRI software, while ESRI India Educational Services provides training solutions to fit all budgets and schedules.

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Online Technical Support Service (OTSS) is now available to ESRI GIS users in India. This Internet based service provides quality and prompt technical support facilitating the users to effectively work with ESRI software.

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ESRI India
GIS and Mapping Solutions

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<http://support.esri.com/index.cfm?fa=projectCenter.gateway>

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- Online Technical Support
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- Phone/e-mail/Fax Support
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- ArcNews and ArcIndia News Subscription
- ESRI India User Conference
- ESRI International User Conference

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ESRI India offers a wide variety of instructor-led courses that explain GIS concepts, explore GIS applications, and teach how to use ESRI GIS software and related technologies. Instructor-led training combines personal delivery, hands-on experience, and class participation to create a rich learning environment. Attendees have ample time to practice their skills and apply what they learn, and instructors have the expertise to answer specific technical and application questions. Classes are held in small groups at ESRI India's state-of-the-art training facilities and at client sites and are always led by experienced, knowledgeable staff.

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Careers at ESRI India

1. Role: Asst Project Manager / Project Manager

Experience: Should have 7+ years of experience in project planning and execution within planned time, cost and quality norms by ensuring effective utilization of the allocated resource.

Skill Sets:

- Knowledge of .Net, Java & J2EE
- Should have sound knowledge of GIS Domain with specifically ESRI technology i.e ArcGIS Server, ArcGIS, ArcSDE, ArcIMS
- Should be hands on with full GIS project life cycle experience
- Experience of team handling, task management and process management
- Solution Architecting and developing project plans.
- Scoping - determining scope, write scope documents and SOWs

Soft Skills:

- Should have good communication skills with experience in managing teams & handling customer requirements

2. Role: GIS Engineer / Sr. GIS Engineer

Experience: Should have 2-7 years experience in GIS

Skill Sets:

- Knowledge of .Net, Java & J2EE
- Working level experience on different OS/Hardware Platforms viz. Windows/Intel,
- Should have sound knowledge of Database / RDBMS like Oracle, MS SQL Server
- Should have sound knowledge of GIS Domain with specifically ESRI technology i.e ArcGIS Desktop
- Should have awareness of various WebServers like IIS, Apache tomcat, etc.
- Sound fundamental knowledge of Network Communications(TCP/IP, http, https, etc.), Client Server Architecture
- Should have good communication skills with experience in managing customer interactions & handling customer requirements
- Should have inclination towards customer technical support services.

Responsibilities:

- Technical Support
- To ensure that the technical support calls from the clients in the entire region are handled by the technical services team in the region as per the QMS goals/ SLA's defined.
- To attend to technical support calls and resolve them as per the QMS goals / SLA's defined.
- To provide onsite technical support
- To Install products in a heterogeneous environment
- To set up testing environment.
- Trainings
- Pre Sales
- To demonstrate software functionalities to customers

3. Role: Business Executive / Sr. Business Executive

Experience: 2 to 6 years of experience in selling IT services and solutions/ Telecom.

Skill Sets:

- Should have handled Large Corporate and Govt. Accounts.
- Establishing and developing large government accounts, new account development and channel development.
- 2 years experience in managing large accounts. Exposure to IT / Telecom-/ software product sales, Systems Integration is a must.
- GIS market understanding shall be preferred.
- Should have high target Orientation & result orientation
- Excellent communication skills and interpersonal relationship

e-mail your resume to gistalent@esriindia.com or send it through post to:

Head, Human Resource, ESRI India
8, Balaji Estate, Sudarshan Munjal Marg, Kalkaji, New Delhi - 110 019, INDIA.
Kindly mention the position applied for and your current location in the subject line.