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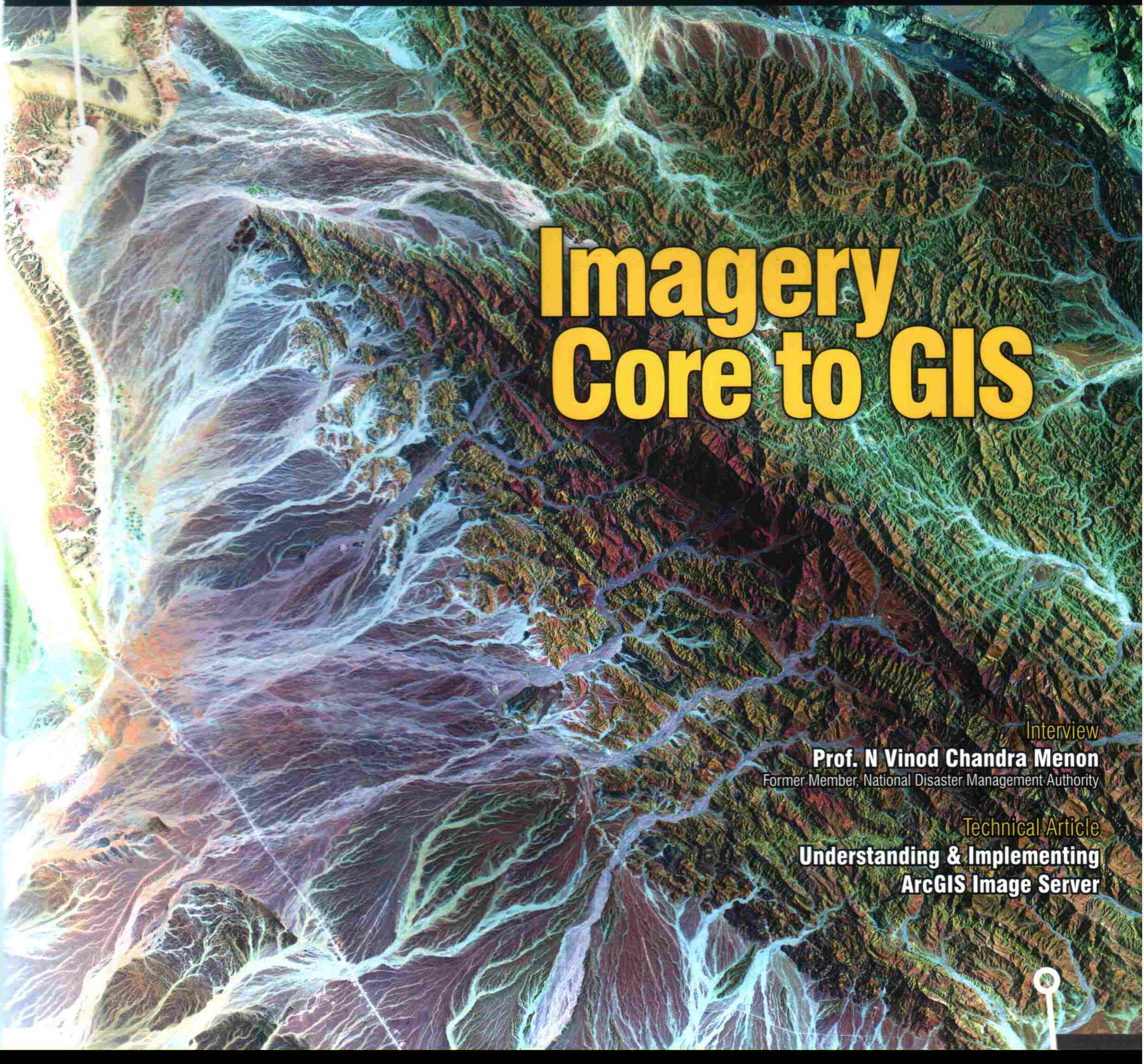

Imagery Core to GIS

Interview

Prof. N Vinod Chandra Menon

Former Member, National Disaster Management Authority

Technical Article

Understanding & Implementing ArcGIS Image Server

From the President's Desk

As we move into 2011 I take this opportunity to wish all of you a very Happy New Year.

It has been a wonderful experience over the last three months for the Esri India team - traveling across 13 cities and hosting over 1700 participants during the recently concluded Esri India GeoVision Series of seminars. The participation was overwhelming and our guest speakers who shared their experience in leveraging Geospatial Technology, especially Esri Technology, gave tremendous insight in to the practical aspects of using the technology and deriving maximum benefit from it. I take this opportunity to thank each of the participants who attended the Seminar Series and a very special thanks to our guest speakers.

The theme of the session - "GIS - opening the world to everyone" is very apt in the current scenario, considering the multitude of challenges we all face today. These challenges are getting more complex, considering the close integration and the interdependence between various countries, businesses and the people of the world, in this connected age. This means, the statement, "understanding precedes action" is very relevant in today's situation, more than ever, and this requires a well integrated and a visually compelling system that enables understanding of the various causes and their effects to take decisive and correct actions.

Geographic knowledge is fast becoming the core of such an understanding process and as demonstrated, Arc GIS 10 from Esri makes harnessing the geographic knowledge for effective decision making that much simpler. From data capture to seamless integration with enterprise system and dissemination across multiple devices and technologies, Arc GIS 10 makes the workflow simpler and smoother. Its close integration with the image processing ENVI suite gives the user an end to end geospatial solution.

The evolution of the technologies revolving around social media makes the collaboration between various stake holders a reality, and expands the participation of different entities involved making the decision making that much more effective. Crowd sourcing is yet another opportunity that has been made possible by this, and as we move forward, we can see this playing a key role in the overall geospatial information management.

Days are not far, when geospatial information becomes the core around which the enterprise information systems are built in many domains, thus creating and leveraging the geographic knowledge that makes better understanding and effective decision making a reality.

The interest shown by the participants in the Esri India GeoVision Series makes me believe that we are in for some exciting times in India, and very soon we will be witnessing a major change in the geospatial information landscape in India.

S Sridhar
President & COO

Inside

ArcIndia News

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Design, Preprint & Production

geospatial

Jack Dangermond receives Global Citizen Award at GSDI 12

Jack Dangermond, founder and President of Esri, received the Global Citizen Award of the Global Spatial Data Infrastructure (GSDI) Association. The award was presented on the opening day of the GSDI 12 World Conference that was held in Singapore from 19 – 22 October 2010.

The Global Citizen Award is an occasional award of the GSDI Association. Recipients have provided exemplary thought leadership and substantive worldwide contributions in both promoting informed and responsible use of geographic information and geospatial technologies for the benefit of society and fostering spatial data infrastructure (SDI) developments or geospatial advancements supporting sustainable social, economic, and environmental systems integrated from local to global scales.

A landscape architect by training, Dangermond is one of the founding fathers of geographic information system (GIS) technology and is considered to be one of the most influential people in GIS. For more than 40 years, he has been an outspoken proponent of GIS as one of the most promising decision-making tools for urban, regional, environmental, and global problems. Esri, which he and his wife, Laura, founded in 1969, has the largest GIS software installation base in the world, with over one million users in more than 300,000 organizations representing business, government, nongovernmental organization (NGOs), and academia. Dangermond has been a leader and visionary in the field, promoting GIS technology beyond that of his own company. He has delivered keynote addresses at international conferences, published hundreds of papers, and given thousands of presentations. His passion for GIS and its application to solving problems, particularly for the causes of the environment and the less empowered in society, is well known throughout the industry. He has been awarded 10 honorary doctorates and received a number of awards, including the Carl Mannerfelt Medal from the International Cartographic Association in 2008; the Public-Private Partnership Award from the National Governors Association in 2009; the Patron's Medal from the Royal Geographical Society in June 2010; and, most recently, the National Geographic's Alexander Graham Bell Medal.

This GSDI 12 Conference is jointly organised by the Singapore Land Authority (SLA) together with GSDI Association, and the Permanent Committee on GIS Infrastructure for Asia and the Pacific (PCGIAP). The theme of GSDI 12 World Conference is "Realising Spatially Enabled Societies". The theme reflects the vast potential for geospatial and location data to augment information, processes and decision making for individuals and society, and the work that remains to be done to encourage creativity and product development for society to truly attain spatial enablement. GSDI 12 allowed the delegates to gain deeper insight into the progress that societies around the world have made in their SDI journey towards spatially enabled societies.

Esri India Strengthens its Team

Dr. Deb Jyoti Pal joined Esri India as Vice President & Head-Technology and Services. In this role, he will be spearheading the Technology and projects deliveries. Deb has approximately 20 years of experience in Strategy Planning, Delivery Management, Program & Project Management and ODC Management, Product Development Life-Cycle, for Geotechnical projects. In his last assignment with Rolta India he was heading Product Management. He has also handled Defence Solutions, Software Development & SEPG for Rolta. Prior to Rolta he has worked with organizations like C-DAC, RSAC-UP & CSRE. Deb is an M.Sc Geology from BHU, PGD in Remote Sensing from IIRS & Ph.D from Visva Bharti University. Being part of Esri India team and he would bring in great contributions and spearhead the growth in the GIS Solutions business.

Souvik Bhattachrya joined ESRI India as VP – Sales (US Geo). Souvik would be driving our US Geo business and would be based out of Washington DC. Souvik is an "old hand" with ESRI technology / Products and before rejoining us he had a stint with Proteans, Inc. as Vice President - Sales and Marketing, handling the IT business. With over 20 years of experience in sales, marketing, account management, building alliances & presales and his past ESRI experience and skills acquisition, he will add great value to the capability of our team and will strengthen the process.

Col. Richard Sundharam joined ESRI India as General Manager – Defence Vertical. In this role Richard would be driving our Defence Vertical nationally and would be based out of Delhi. Richard has over 20 years of experience in strategic planning of IT projects, Project Management, Operations and Relationship management. He served the Indian Army till 2009, in his last assignment with Indian Army he was posted as Director – Information Technology, Army Head Quarters, Delhi. He left Army to join Tech Mahindra and was later transferred to Satyam Mahindra as AVP- Sales & Business Development – Defence. Richard is a B.Tech in Electronics & Communication from JNU and M.Tech from IIT Kharagpur.

Esri India participates at NSDI 10: National Geospatial Ecosystem – The Road Ahead

NSDI 10 was organized and hosted by AGI (Association of Geospatial Industries) in collaboration with FICCI and Department of Science & Technology, Govt. of India from 23-24 December 2010 at FICCI Federation House , New Delhi. Esri India is one of the members of AGI along with other AGI members Erdas, Rolta, GIS Development hosted the event on behalf of AGI.

NSDI – 10, with its theme "National Geospatial Ecosystem – The Road Ahead" started with the aim to deliberate upon and focus on the role of geospatial industry in transforming NSDI from enabling platform to a performing platform. NSDI 10 was inaugurated by Kapil Sibal, Hon'ble Minister for HRD, Telecom, Science & Technology and Earth Science, Government of India, along with other eminent guests Subba Rao, Surveyor General of India, Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences, Government of India and KK Singh, President AGI and Chairman Rolta India Ltd.

Kapil Sibal, Hon'ble Minister for HRD, Telecom, Science & Technology and Earth Science, Government of India, said that this "sunrise sector," as the geospatial sector is referred to as, is still waiting for the sun to rise and this can be achieved through partnering with the industry and identified a lack of unified self-regulated mechanism as what is ailing the industry. The inaugural session of NSDI 10 also witnessed presentation of the Report of Task Force on 1:10,000

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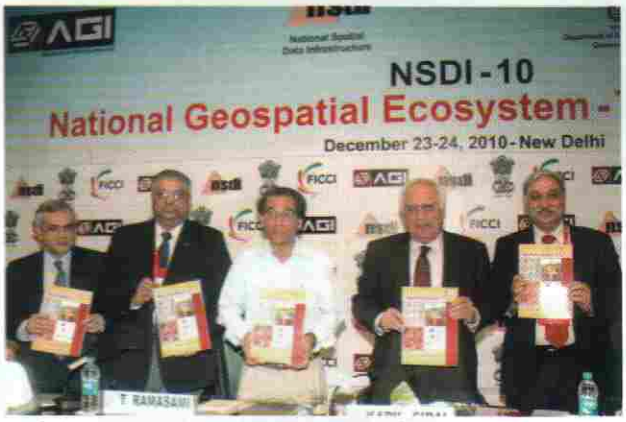
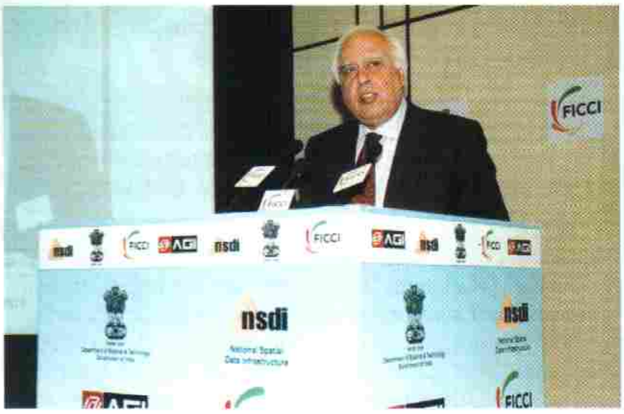


Task force Report on 1:10000 Mapping being presented



Mr. Kapil Sibal giving the Inaugural Address

Panelist addressing the theme National Geospatial Eco-system – The Road Ahead

Mr. Rajesh Mathur and Maj. Gen R Sivakumar felicitating Mr. Vishwanath Anand , the famous Chess Champion & Brand Ambassador of NIIT Group

Mapping, and the release of the geoportal of the Prakasam district in Andhra Pradesh.

The main highlight of the NSDI 10 was the Panel Discussion on "National Geospatial Eco-system – The Road Ahead" that explored the role that government and industry can take together towards successful NSDI. This session was chaired by Major General (Retd.) M. Gopal Rao, former Surveyor General of India who observed that there has been a case of delay both with the industry and government. He opined that the government needs to look at industry as partner in keeping datasets updated. He also observed that industry is currently working in watertight compartments just as the government was about 6-7 years back. The panelist on the panel were Rajesh Mathur, Vice Chairman, Esri India and Co-Chair, FICCI Task Force on Geospatial Technologies, Kaushik Chakraborty, Vice President, Erdas Asia Pacific, Ajay Seth, Managing Director, Elcome Technologies, Dr. PG Diwakar, Associate Director EOS ISRO and Amit Khare, Joint Secretary, Ministry of Human Resources Development

Mr. Rajesh Mathur, highlighted new paradigms in content creation and stressed that integration with other IT subsystems is mandatory. He observed that Indian geospatial industry can be a provider of enabling technology and can play a role in data creation and maintenance. Kaushik Chakraborty, dwelt on how to empower citizens. He expressed that they need knowledge which comes from information, which in turn comes from data and the need of the hour according to him is not just map policy but data sharing policy. Ajay Seth, Managing Director, Elcome Technologies touched upon data accuracy and precision and their significance in GIS analysis. Dr. PG Diwakar of ISRO highlighted how ISRO has been proactively pushing for data availability for use by various organisations. He also informed that industry has been used in significant way where data creation is concerned and that ISRO is trying to make a common gateway for various data. Mr. Amit Khare, Joint Secretary, Ministry of Human Resources Development

Dr. Deb Jyoti Pal speaking on Cloud Technology & NSDI

expressed that industry needs to be involved in curriculum issues and identified four aspects to be addressed: training and orientation of users as well as decision makers, relevant education at university level, relevant education at school level, and citizen awareness as user and developer.

Dr. Debjyoti Pal, Vice President & Head Technology Services Esri India presented his view on migration to SDI on top of cloud computing. He demonstrated how cloud computing works in an organisation and can lead to significant cost savings in IT infrastructure, highlighting three companies making it possible: Google, Microsoft and Amazon during the Technical Session on Technology & NSDI.

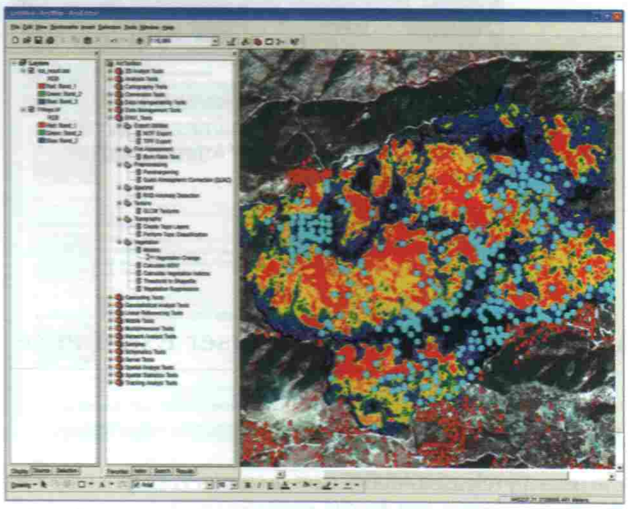
The other Technical Sessions were on Role of NSDI in Major National Programs, Status of Various NSDI Nodes, Applications & NSDI, Status of State SDIs. NSDI 10 ended with the Communiqué presented by DST and a Valedictory Address by Dr. Shailesh Nayak, Secretary, Secretary, Ministry of Earth Sciences, Government of India. NSDI 10 also witnessed Surprise Guest of Honour Mr. Vishwanath Anand who is also the Brand Ambassador of NIIT Group.

ENVI for ArcGIS® Server: Delivering Powerful Image Analysis Tools to Your ArcGIS Enterprise

Extend Image Analysis to Your Organization

The demand for timely and accurate information from geospatial imagery is growing in industries from defense and intelligence to urban planning and development. ENVI is the software solution used by professionals across industries to quickly, easily, and accurately extract information from imagery and provide current and detailed information about an area of interest for updating geodatabases.

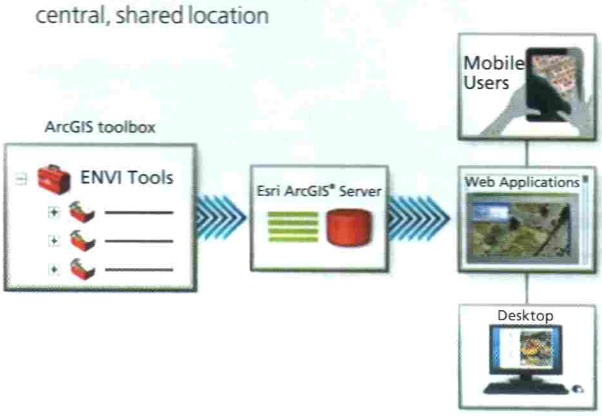
As organizations rely more on geospatial imagery, the transition to server-based platforms like Esri's ArcGIS Server for image management and dissemination increases efficiency and collaboration across the workflow, creating an environment that is not only easier for administrators to manage, but for end users to access. Now, you can easily deliver ENVI's advanced image analysis tools to the ArcGIS Server environment using ENVI for ArcGIS® Server, a revolutionary new product that provides the tools users across the enterprise need to effectively add important information about a geographic area to their GIS.



ENVI for ArcGIS® Server allows you to author, publish, and distribute image analysis tools and models to your entire organization. With ENVI image analysis tools available within the familiar ArcGIS Server environment, end users now can take full advantage of the rich geographic data contained in imagery.

With ENVI for ArcGIS® Server You Can:

- Author models and tools on the desktop to provide customized image analysis functionality to your organization
- Publish models and applications across the enterprise to increase overall productivity and return derived data to a central, shared location



- Use image analysis applications and models published through the ArcGIS Server platform on a desktop, mobile, or Web client

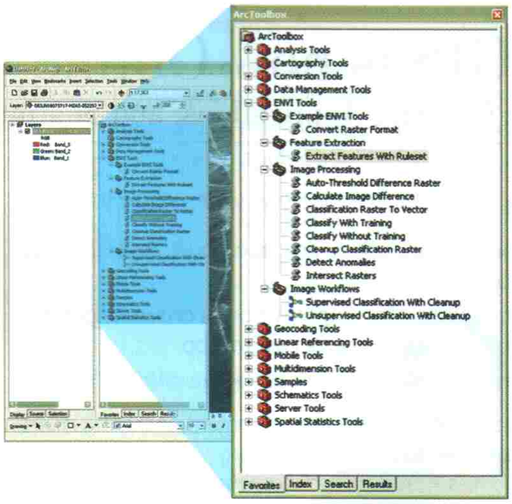
Extend Image Analysis to Your Organization

Exposing ENVI image analysis capabilities to the Esri ArcGIS Server environment enables you to leverage server class resources to analyze large image scenes and take full advantage of the information in imagery. And, because ENVI for ArcGIS® Server is compatible with ArcGIS Web Mapping, you can easily create, manage, and distribute ENVI image analysis applications and models over the enterprise to desktop and mobile clients or to web applications.

Author Image Analysis Tools and Models

With an ENVI desktop license, ENVI image analysis tools are readily available in the familiar ArcGIS environment and can be used to author powerful GIS applications. ENVI image analysis tools make it easier than ever to include data and information derived from imagery in the geospatial applications you create with ArcGIS such as maps, globes, geoprocessing models, and more.

- Add image analysis capabilities to your existing tools and models
- Combine multiple tools that include image analysis functionality to create a new model
- Create new tools for image analysis



ENVI tools are available directly within the ArcToolbox making it easy to author GIS Models and applications with image analysis capabilities.

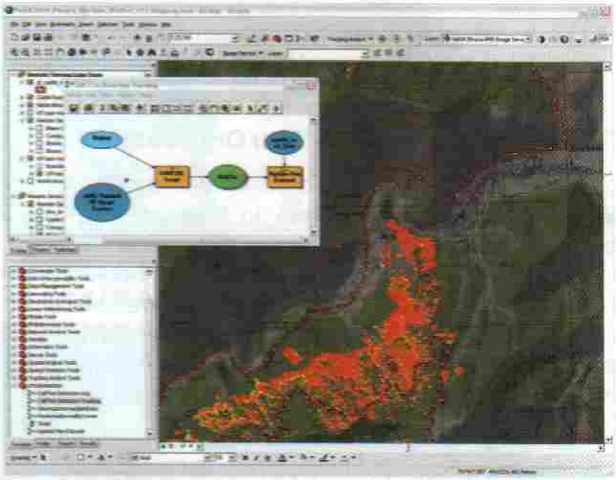
Publish Image Analysis Tools and Models

Once models and applications are built, you can publish them to users across the ArcGIS Server enterprise. To do this, determine the geoprocessing tools or models that utilize the ENVI functionality you want to share and push it to the ArcGIS Server. Now, the tools and models you create will be readily available and customized to the needs of your organization. Publishing applications and models with ENVI image analysis capabilities helps the organization increase efficiency, improve the decision-making process, and maximize return on investment.

- Automate complex image analysis tasks
- Incorporate information from imagery to GIS models and services

Technolgy Update

- Deliver image analysis and workflows to a large base of users
- Leverage server class resources to analyze large imagery and data

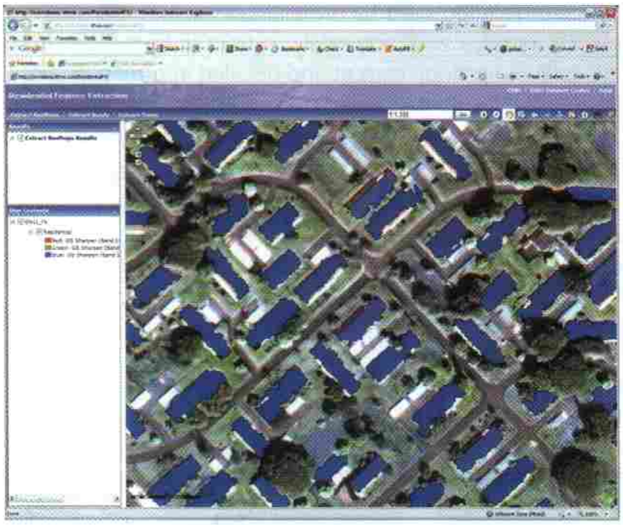


It's easy to publish ENVI image analysis capabilities through the familiar ArcToolbox and ModelBuilder paradigms.

Use Models and Applications Published to ArcGIS

By authoring image analysis applications with the ENVI desktop and publishing them with ENVI for ArcGIS® Server, your entire organization can access ENVI image analysis tools whether they work in a mobile, desktop, or Web environment. And, because applications and models can automate complex image processing tasks, like RPC orthorectification, change detection, and land classification, users of all ability levels can take advantage of the geographic information they provide.

- Forest fire applications can provide fire fuel load information in real-time to fire fighters
- City planners can utilize applications that determine urban sprawl, floodplains, and more
- Forest rangers can determine the extent of forest damage from beetle kill or natural disasters



Above is an example of a web application that has integrated ENVI's image analysis capabilities and ArcGIS to allow users to easily extract features of interest, such as rooftops, from imagery.

ArcGIS is now Online

Online Content, Applications, and Sharing Are a Seamless Part of the User Experience

Highlights

- ArcGIS online capabilities are now built into the user experience.
- Users can access online content from a browser, desktop application, mobile device, or custom app.
- Users can share their maps and apps across different clients.

Quick and easy access to geographic content, including maps, apps, and developer tools, is critical to any GIS project and can save valuable time and money. ArcGIS online capabilities provide a framework for delivering cloud-based GIS that supports collaboration between different groups or communities, regardless of the client application that is being used.

Users can add their own data on top of detailed, ready-to-use global basemaps.

Access from a Browser

Esri recently released ArcGIS.com, a central Web gateway into the ArcGIS system and ArcGIS online content. Users can find, share, organize, and use maps, apps, and other resources published by Esri and the user community. Users can also build communities around common interests by creating specific groups and organize and share their content through these groups to facilitate collaboration. Users can post comments and rate their favorite maps and apps so that others can search by most viewed, highest rated, and favorite content.

ArcGIS Desktop users can find, share, and use ArcGIS online content from within the ArcMap application.

In addition, ArcGIS Explorer now has an online version that can be accessed from a Web browser. ArcGIS Explorer Online is the same application that has been available on the desktop, but it is now available as a browser-based application that doesn't require a download. ArcGIS online content can be accessed directly from within ArcGIS Explorer Online to create maps that can then be shared and consumed by the broad community.

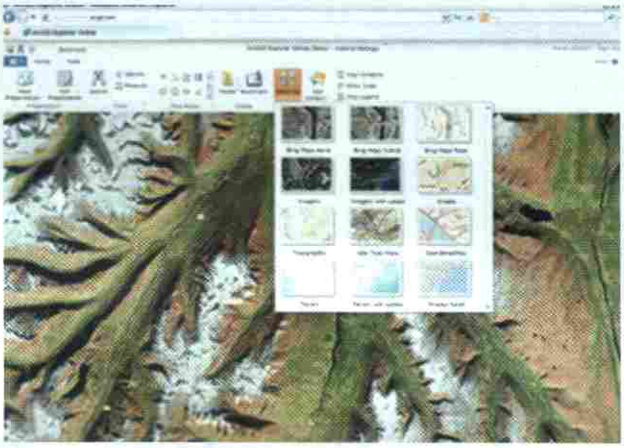
The JavaScript Web mapping application is another new browser-based application. It provides a quick and easy way to create maps online. It uses Esri's basemaps as a starting point, and users can then search ArcGIS online content or other GIS servers and the Web to find additional layers and create mashups. These mashups can also be shared and consumed by others, including users of the ArcGIS for iPhone mapping application.

Access from ArcGIS Desktop

With the release of ArcGIS 10, ArcGIS Desktop is tightly coupled with ArcGIS online content and capabilities. Users can browse, use, and share content directly from the ArcGIS Desktop ArcMap application. This includes content that is publicly available (e.g., basemaps published by Esri) and user content that has been published through groups. Once an ArcGIS Desktop user has authored a map that includes ArcGIS online content, the map can be uploaded by creating a layer package. By uploading that layer package, other users can then find and use the authored map.

Access for Mobile Users

Mobile users will also be able to browse and consume ArcGIS online content. They can do this through the ArcGIS for iPhone application built with the ArcGIS API for iPhone. The application provides instant access to ArcGIS online maps and allows users to search content, select maps, and add them to their favorites. Using native iPhone gestures, users can browse ArcGIS online maps, perform queries, search, identify, and perform GIS analyses based on the information that was authored as part of the map. Field-workers can also use the iPhone application to collect and update features, then post their updates to an on-premises server. An application and API for Android are planned for a later release (see related article about "ArcGIS for iPhone").



ArcGIS Online basemaps can be accessed and added directly from within ArcGIS Explorer Online (Copyright © Harris Corp., Earthstar Geographics LLC, Copyright © AND, Copyright © 2010 Microsoft Corporation/Bing).

Access for Developers

In addition to the mobile software development kits (SDK), developers can use ArcGIS Web Mapping APIs for JavaScript, Flex, and Silverlight/WFP to leverage ArcGIS online content for quickly building Web mapping applications.

More Information visit www.esri.com/onlinegis

Feed Back

Arc India News always brings the latest applications and new concepts to our desk. In last Issue titled "New Era of Cloud Computing and GIS" is very informative.

As a GIS Specialist and as a Researcher I am benefited through ESRI one day seminar which brought all the applications through various departments and GIS users in a single platform.

Kavitha Natrajan
GIS Specialist
MDPU, PWD, Chennai

In Arc India News issue on GIS designing the Future, the most interesting article was the GIS: Designing Our Future where Dr. Jack Danagermond mentioned GIS is opening the World to Everyone is very well said especially for the GIS domain where the most effective way to communicate geographic knowledge thru GIS and is especially useful in helping make our governments transparent, accountable, and engaged with citizens. Other articles written by other authors & experts are quite useful for the academic purpose. I wish all the best to Arc India News team to bring out more successful stories in future.

Mr. Praveen Kumar Rai, M.SC., M.TECH, P.HD (PURSUING)
Lecturer (PGDRS & GIS)
Department Of Geography, Banaras Hindu University

ArcGIS Server Image Extension

Fast Dynamic Image Processing & Distribution

Overview

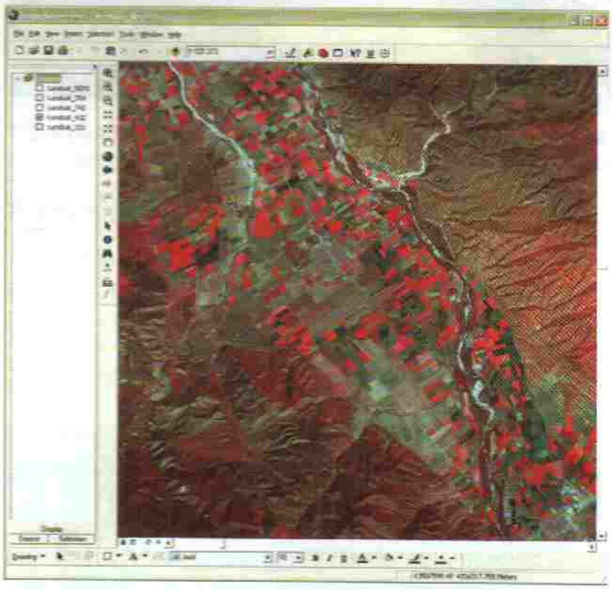
The ArcGIS Server Image extension enhances the capabilities of ArcGIS Server to manage, produce, and exploit large numbers of imagery and rasters.

With this extension, you can

- Provide imagery access quickly after acquisition with dynamic mosaicking and on-the-fly processing.
- Minimize data duplication while maximing the amount of imagery products that can be created because image processing and serving has been combined.
- Remove the reliance on static mosaics and allow users to request custom imagery with client-controllable parameters.

The Image extension tremendously simplifies image management by allowing users to directly publish large image collections without preprocessing.

- Dynamically mosaic images in different projections, formats, locations, and pixel sizes.
- Fast, server-based processing enables on-the-fly creation of multiple image products from a single source.
- Provide important service and image level metadata.
- Use effortless distribution, serving very large volumes and numbers of rasters to a large range of client applications.



Key Features

The chart below shows the different capabilities that a user can expect out of the box with ArcGIS Server and with the addition of the optional Image extension.

Capabilities	ArcGIS Server	ArcGIS Server withImage Extension
Creating image services from any single image	✓	✓
Changing rendering from ArcGIS Desktop clients	✓	✓
Optimizing data transmission for low-bandwidth connections	✓	✓
Using image service as a data source for geoprocessing	✓	✓
Service-level metadata	✓	✓
Serving multispectral and elevation data	✓	✓
OGC compliant (WMS, WCS)	✓	✓
Dynamically mosaicking multiple images into an image service		✓
Client control over order of overlapping imagery in a mosaic		✓
Image-level metadata		✓
Accessing additional CAD and GIS clients		✓
Server-side orthorectification		✓
Server-side pan sharpening		✓
Server-side rendering, enhancements, filtering, and map algebra		✓
Creating multiple products from the same source		✓
Creating image service definitions		✓
Defined image processing		✓

Advantages of ArcGIS Server Image Extension

Increase the value of your imagery by making it available to those who need it in less time and with less effort. With ArcGIS Server Image Extension, you can make large volumes of imagery available to users almost immediately.

Traditionally, users struggle to work with hundreds or thousands of individual image files. These files are usually stored and accessed one at a time, or in some cases, considerable effort is taken to process, mosaic, and distribute large mosaicked files. As end users wait, the newly acquired imagery ages and loses value.

The final image products consume significant bandwidth as users access large image files across the network. This workflow leaves much to be desired in the way of efficiency and timeliness of image availability.

With ArcGIS, you can publish image services directly from your source imagery. You can easily publish these collections of multiscale and composite images as a single virtual image to your users without having to process the images. Because the mosaicking and processing is on the fly, only the raw imagery needs to be stored, reducing storage requirements. Metadata for raw images is preserved and kept available. Users can access imagery in any client, and bandwidth use is lowered; as only the image data needed for display is sent to the user, there is no need to access the entire mosaic or image file. ArcGIS reduces the time and resources required to make imagery available to those who need it.

The Image extension broadens the capabilities of ArcGIS Server to both serve and process very large volumes of images. It provides dynamic mosaicking and on-the-fly processing, enabling the full information content of imagery to be exploited. By making imagery quickly accessible, the value of imagery is increased. The Image extension builds on the capabilities of image services and provides additional functionality for organizations.

The ArcGIS Server Image extension provides the following benefits:

- Tremendously simplifies image management by allowing users to directly publish large image collections without preprocessing

  With the Image extension, users can do the following:

  - Directly publish images in their raw format (without preprocessing) as image services.
  - Directly create image services out of large numbers of

individual images that may be in different projections, pixel sizes, and locations.
- Create Internet Services Definition (ISCDef) files.
- These define what images are to be part of the image service, how they will be mosaicked, and other parameters like orthorectification, pan sharpening, and enhancements.
- Reduce the elapsed time between imagery acquisition and exploitation.

- Dynamically mosaicks together images in different projections, formats, locations, and pixel sizes
- Fast, server-based processing, enabling on-the-fly creation of multiple image products from a single source
- Provides important service- and image-level metadata
- Effortless distribution serving very large volumes and numbers of rasters to a large range of client applications

Advantages for Users

- Fast, single point of access to large volumes of imagery
- Ability to control order of overlapping imagery
- Image-level metadata retention
- Automatic update of image services when new imagery is available

Advantages for Data Managers

- Simplifies data management and maintainability
- Enables multiple imagery products to be created directly from a single source
- Removes the requirement to preprocess, premosaic, or load imagery
- Resolves the issues related to pregenerating mosaics
- Is easy to integrate into existing workflows

Note: At ArcGIS 9.3, ArcGIS Image Server became available as an extension to ArcGIS Server and is now known as the ArcGIS Server Image extension. The ArcGIS Server Image extension is available for ArcGIS Server Standard and Advanced editions.

ArcGIS is a complete image management system supporting enterprise workflows.

Image Service Integrated with Parcel Data (courtesy of City of Ft. Pierce, Florida)

Multiple Viewpoints of Aerial Imagery (courtesy of Amberg, Germany)

For More Details please see the Article on Understanding & Implementing ArcGIS Image Server on Page No:
Source: www.esri.com

Introducing ENVI 4.8

Regardless of your industry, from forestry and agriculture to defense and intelligence, your reliance on geospatial imagery as a source of important geographic information continues to grow. ENVI is the premier software solution for extracting information from geospatial imagery. ENVI delivers innovative, time saving ways to get information from imagery, while making it easy to incorporate image processing and analysis into your existing workflow.

Now, the latest release of ENVI delivers features and functionality to further streamline your workflow and reduce the time you spend on image processing and analysis. ENVI 4.8 makes it seamless to update a GIS with current information from geospatial imagery by delivering image analysis tools directly from the ArcGIS environment. A new, high performance LiDAR viewer allows you to easily incorporate information from LiDAR data with your other geospatial data, and a new workflow for viewshed analysis automates and streamlines a multi-step process. And, because ENVI is built on a fully extensible platform, you can easily customize it to your specific imagery needs.

ENVI Image Analysis Tools Now Available in ArcGIS®

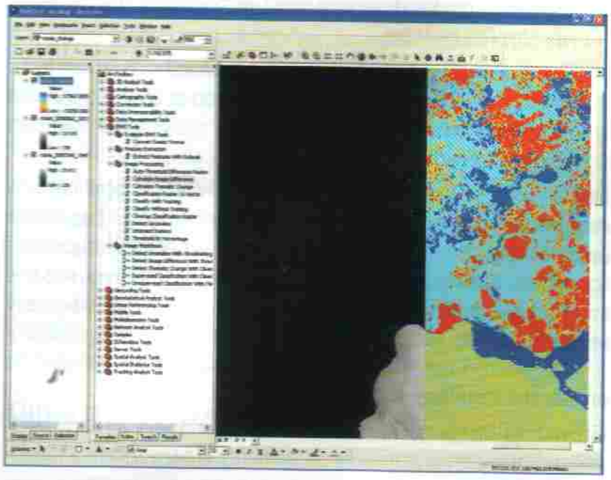
In the past, updating a GIS with valuable information obtained from geospatial imagery required multiple tools. With ENVI 4.8, image analysis capabilities are fully integrated with ArcGIS, eliminating the need to switch between software packages.

ENVI 4.8 completes the integration with ArcGIS from Esri – delivering for the first time, advanced image processing and analysis tools directly from the ArcGIS desktop and ArcGIS® Server environments. Because ENVI 4.8 is completely compatible with ArcGIS 10 and 9.3, you can now include imagery in your workflow while taking advantage of the latest technology that Esri has to offer.

The new ENVI tools for ArcGIS are available in a familiar ArcGIS toolbox, exposing ENVI functionality through geoprocessing scripts that operate in both desktop and server environments. ENVI provides you with nearly 20 pre-built tools to easily perform a variety of advanced image processing and analysis tasks without leaving ArcGIS, allowing you to:

- Detect change over time
- Find and extract features of interest
- Classify features or land cover
- Identify anomalies

For ArcGIS® Server users, ENVI tools can also be delivered to your entire organization using the newest addition to the ENVI product line, ENVI for ArcGIS® Server.

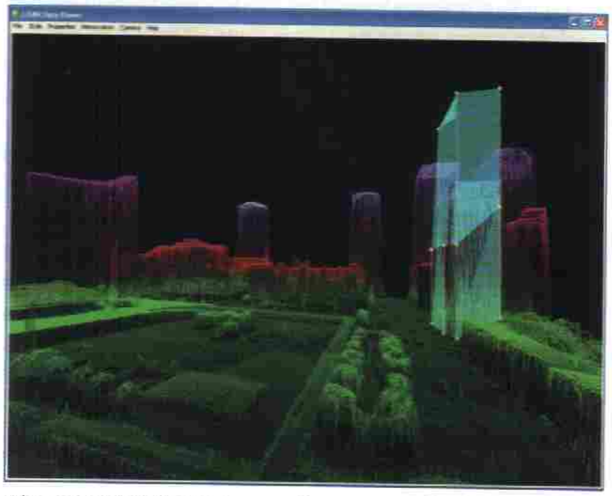


Above you can see the ENVI tools within the ArcToolbox. The image in this scene is the result of running an ENVI image analysis tool designed to calculate the differences between images.

Easily Add LiDAR Data to Your Workflow

Geospatial information comes in a variety of formats, all of which help to build a complete picture about a geographic area. With ENVI 4.8, you'll have the tools you need to combine different data sources and the information they provide to piece together a complete picture of an area of interest.

ENVI 4.8 introduces the LiDAR viewer, extending the existing ENVI LiDAR functionality by adding a high performance, 3-dimensional viewer that efficiently works with very large LiDAR data sets. And, with the ability to quickly and easily display point clouds in a variety of colors and ranges, the new LiDAR viewer will help you visually interpret your data and give you a more complete understanding of a particular area of interest.



The new ENVI LiDAR viewer allows you to display point clouds in a variety of colors and ranges

Use the ENVI LiDAR viewer to:

- Filter by return, elevation, or point classification
- Display your data with a variety of surface types
- Measure height or volume of any structure
- Add custom color palettes

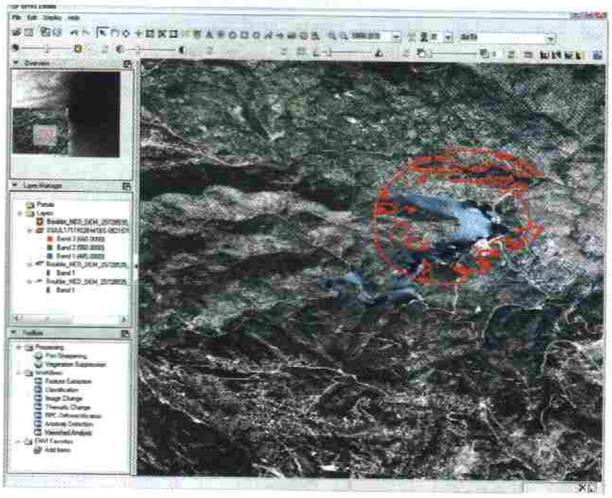
And, with the high performance ENVI LiDAR viewer, you can easily underlay a satellite or airborne image with your LiDAR display to create important situational awareness.

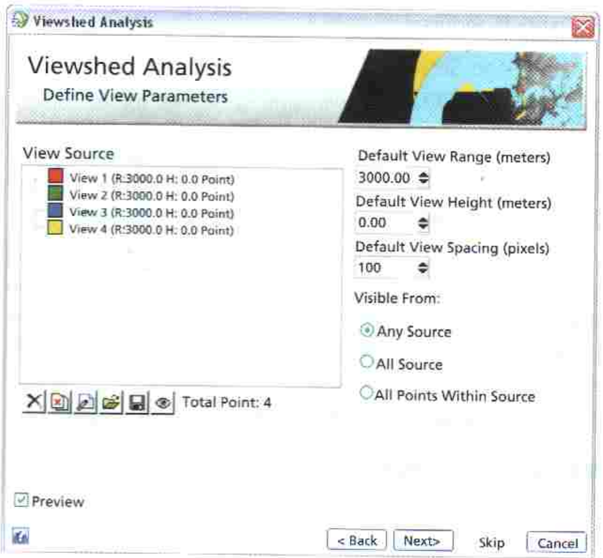
New Automated Workflow for Viewshed Analysis

In recent releases, ENVI introduced automated workflows to make a variety of tasks less labor intensive. ENVI workflows deliver scientifically proven methods for processing and analyzing imagery in step-by-step, wizard-like processes that make advanced functionality available to users of any experience level.

The new viewshed analysis workflow in ENVI 4.8 guides you through the multi-step process of viewshed analysis, providing you with the information you need to make important tactical decisions, such as where to strategically place a cell tower for maximum coverage, determining the safest path for troop movement, or identifying out-of-site locations for concealing landfills and wastewater treatment centers. The ENVI viewshed workflow allows you to easily exploit a DEM and determine visible areas from a variety of view sources, including points, lines, or polygons, so you can easily:

- Export results directly to raster, vector, or an ArcGIS geodatabase
- Define multiple, simultaneous viewshed points, polylines, or polygons
- Determine viewshed and viewrange independently





A new ENVI workflow guides you through the multi-step process to perform a viewshed analysis.

Technical Article

Understanding & Implementing ArcGIS Image Server

Geospatial imagery is the foundation of most mapping and geographic information system (GIS) technology. Many organizations need to manage rapidly expanding catalogs of imagery from various sources such as scanned maps and aerial films, digital cameras, satellite imagery, and digital terrain models. Such huge quantities of imagery pose difficulties in managing, processing, and distributing data to users.

The value of imagery is greatest when large numbers of users have quick access to it. When using conventional solutions, the steps in managing, processing, and distributing imagery are time-consuming, and users have difficulty accessing and utilizing the imagery within familiar applications. When new source imagery is captured, users must wait until it is processed and loaded into a data storage and distribution system before they can request the data from an imagery server. Processed source imagery grows to multiple datasets that administrators must maintain and store individually. Even when directly using preprocessed imagery, there is often a substantial cost in time and storage required to convert or load it for use in a server environment.

ArcGIS® Image Server is an enterprise-wide image distribution platform from ESRI, the world leader in GIS. It provides a new approach for managing, processing, and distributing imagery that immediately reduces costs and improves workflows. ArcGIS Image Server provides fast access and visualization of large quantities of imagery, processed on the fly and on demand. Image processing is performed by the server, eliminating the need to preprocess the imagery after capture. This gives users immediate access to the imagery once it is acquired. Imagery that is preprocessed can similarly be very quickly served. When a client makes a request, ArcGIS Image Server processes the imagery and delivers it along with important metadata to the client almost instantaneously.

ArcGIS Image Server handles image processing on the fly for each client request; therefore, only the source imagery needs to be stored, which eliminates the need to maintain multiple datasets. As new imagery is added or updates are made to the processing requirements, changes are immediately reflected in the processed imagery delivered to clients, thereby reducing maintenance costs. Additionally, with only a single set of imagery to maintain, storage requirements are substantially reduced.

ArcGIS Image Server provides a wide range of processing options that gives users all of the benefits of processed imagery without the normally higher costs. By supporting leading third-party client applications—including applications from ESRI, Autodesk®, and Bentley—ArcGIS Image Server allows users to leverage imagery within familiar applications.

Unlike other image server solutions that serve only static, preprocessed imagery, ArcGIS Image Server is an enterprise product that meets all image management, processing, and distribution needs. In turn, this simplifies integration with existing systems and workflows.

The Growing Need for Better Access to Imagery

Importance of Imagery

Imagery is important for many applications and can be used in several ways including the following:

- As a natural background in many GIS applications, where it is often used to assist navigation. The popularity of sites such as Google Earth™ has increased the demand by users to see imagery as a backdrop to their applications.
- For direct interpretation, it is used to identify features such as new roads, housing developments, and other aspects of a changing landscape.
- As the source for digitizing most vector maps, it is the basis of most GIS systems.
- For the verification of vector data. Questions often arise about the reliability of vector data used in an analysis, and frequently more up-to-date imagery is available that can be used to verify the vector data.

Not all uses of imagery are the same. Different applications require imagery optimized to different criteria. For some applications, timeliness of the imagery is especially important; for others, quality or resolution; while for some others, it is the sun's angle; and so on. For some applications, specific new imagery will be acquired, while for others, existing imagery will be utilized but may need to be enhanced or ordered to ensure the optimum imagery is displayed.

Growth of Imagery Huge quantities of imagery already exist and are growing exponentially. Not only are the volumes of imagery increasing but also the depth of imagery in terms of the following factors:

- **Resolution**—The resolution of the sensors is increasing, resulting in finer visible details and much larger dataset file sizes covering the same area.
- **Dynamic range**—The bit depth, or spectral resolution, is increasing from 8 bits to 12 bits and higher per channel. This higher dynamic range in the sensors provides better spectral detail, which, for example, enables one to see details within shadows.
- **Spectral bands**—Many new sensors have more spectral bands. Many aerial cameras capture the near-infrared band in parallel with red, green, and blue. Satellites with higher numbers of bands are being launched, some with hyperspectral sensors that have hundreds of bands.
- **Overlap**—The overlap of imagery is increasing. The same areas are being acquired repeatedly by satellites, thereby providing temporal data. In aerial photography, it is standard practice to acquire imagery with a high overlap for stereo coverage.

Imagery is becoming increasingly inexpensive, and many datasets are available for free. Currently, one key issue with geospatial imagery is accessibility. There is plenty of imagery available, but only a small fraction of it is actually accessed and used. If imagery is made quickly accessible to larger numbers of users, the value of the imagery increases significantly.

With conventional solutions, image processing and distribution has been time consuming, and end users have had difficulty accessing and utilizing the imagery within familiar applications. When new source imagery is captured, users must wait a long time until it is processed and loaded on a server before it can be accessed. During image processing, datasets grow into multiple versions that administrators must then maintain, which further adds to costs. Even with the subsequent compression of the imagery, which typically reduces image quality, these datasets can become difficult to maintain and manage.

Uniqueness of Imagery

The solutions required to manage, process, and distribute imagery often need to be different from other geospatial data. Imagery distinguishes itself from other data by the following aspects:

- **Volume**—The volumes of imagery are generally larger than other geospatial datasets. Imagery datasets can often be in the multiterabyte range or greater. Traditionally, their storage, management, and distribution have been challenging.
- **Value**—The value of imagery changes quickly. For most applications, imagery has its highest value when it is new, and the value decreases over time. In some applications, the value can be reduced substantially in hours or days; for other applications, it can be reduced in weeks or months. For most applications, the latency between image acquisition and exploitation needs to be reduced to maximize the value of imagery. There are some applications, such as change detection, where the value increases again over longer time periods.
- **Fixed**—An image is actually a snapshot of the earth acquired at an instant of time. Unlike a road or utility network dataset, imagery is not edited and the image does not change. What does change over time is how the image is processed to create different products to be visualized or analyzed.

Different States of Imagery

Organizations that acquire imagery normally receive the data in one of the following states:

- **Tiled or mosaicked images**—These are generally the products of traditional mapping programs where the imagery is processed, mosaicked, and cut into tiles similar to map sheets. Large volumes of such imagery exist such as digital orthophoto quadrangles (DOQ), National Aerial Imagery Program (NAIP), and Controlled Image Base (CIB) formats. In many cases, such image products are further mosaicked and compressed into formats such as MrSID® or JPEG 2000. Tiles, or mosaicked imagery, should be delivered with both georeferencing data and metadata defining its source and accuracy. These datasets are primarily used for viewing as a background data source. Due to preprocessing, some of the original data content may be lost, thereby limiting the type of analysis that can be performed. Understanding and Implementing ArcGIS Image Server
- **Rectified scenes**—These are images delivered as individual scenes, generally from satellites. Each scene is acquired at a specified time from a specific sensor. Scenes are rectified to the ground using a spatial reference system and should come with metadata defining the source and accuracy. They are typically multispectral and are often not radiometrically adjusted for visualization, so they can be used for different analyses. For visualization of large areas, the multiple scenes need to be enhanced and mosaicked together.
- **Nonrectified scenes**—These are images acquired using digital cameras or satellites or from scanning of film or existing mapping. They have limited preprocessing applied to them and need to be georeferenced before they can be used within a GIS application. Most modern sensors include the approximate georeferencing information, and their accuracy can be enhanced with access to ground control and a terrain elevation model. These images have the most data content but require more data processing.

ArcGIS Image Server—Fast, Dynamic Image Processing and Distribution

Traditionally, image processing and distribution have been considered two separate stages in image exploitation. This separation causes data redundancy, radically expands volumes of data, and hinders efficient data management. With ArcGIS Image Server, these two stages are combined, enabling administrators to maintain only the primary

imagery with multiple image products created on the fly as required by users. This is a significant and unique paradigm shift in how imagery is managed, processed, and distributed, which resolves many issues pertaining to imagery.

Provided by ESRI, ArcGIS Image Server is a complete enterprise imaging solution that caters to all imagery requirements. Unlike other image server solutions that serve only static, preprocessed images, ArcGIS Image Server is an enterprise product that uniquely combines image distribution and on-the-fly, server-based image processing. It provides enterprise-wide access to very large image datasets within GIS, CAD, imaging, and Web applications, allowing users to manage, process, and quickly serve large quantities of raster data for visualization and analysis to a variety of clients. Bottlenecks in conventional image-processing workflows can be resolved since the raster datasets can remain as files on servers in their original form, then processed and distributed at once without extensive preprocessing or loading into a database.

The Value of ArcGIS Image Server

ArcGIS Image Server provides value to any organization involved in image storage, processing, and distribution. By reducing the data storage costs and manpower required for data processing and maintenance, ArcGIS Image Server gives users an immediate return on their investment. In addition, by significantly increasing accessibility to imagery, the value of the imagery is increased.

The immediate value of ArcGIS Image Server is derived from the following:

- **Fast access to geospatial imagery**—ArcGIS Image Server provides access to source imagery without requiring any preprocessing, eliminating data redundancy and making imagery available to clients quickly. Plus, clients can access the imagery they need almost instantaneously, without lengthy load times.
- **On-the-fly image processing**—ArcGIS Image Server processes source data on the fly, minimizing storage requirements and reducing the latency between data capture and use by staff.
- **Data and client interoperability**—ArcGIS Image Server provides access to multiple image file formats from multiple clients, eliminating the need to convert source data into proprietary formats.
- **Full scalability**—ArcGIS Image Server can scale to meet users' current and future technical and functional requirements.

ArcGIS Image Server is able to generate multiple image products from a single source, each with different radiometric processing, geometric processing, and compression options. This on-the-fly processing maximizes the information content that can be obtained from the imagery without the need for costly preprocessing. ArcGIS Image

Server thereby enables users to eliminate management problems associated with multiple preprocessed datasets and can substantially reduce data storage requirements. Server-side processing also allows access to raster data from thin-client applications, reducing requirements for workstations to access and process the imagery.

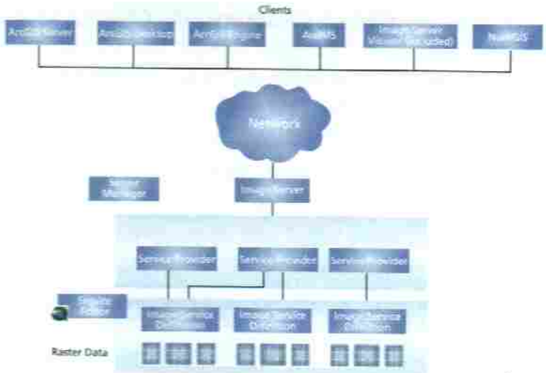
Who and What Applications Use ArcGIS Image Server?

ArcGIS Image Server enables the user to exploit the value of new raster datasets for a range of applications such as the following:

- Emergency response and planning for security and military operations require fast access to huge raster datasets after acquisition. In emergency situations, people need to access information quickly. ArcGIS Image Server allows users to take the acquired imagery and make it available online in a timely manner. Additionally, users can update the service with new imagery as it becomes available or update the georeferencing or radiometric processing as parameters are more clearly determined.
- Municipalities and utilities with large numbers of users need access to different imagery from different applications. Many municipalities often provide public access to their imagery as orthorectified datasets while also requiring higher-resolution versions for use in their own planning departments. With ArcGIS Image Server, the same imagery can be accessed at a higher resolution by planning departments and public access restricted to a coarser resolution.
- Data acquisition and provisioning organizations manage, process, and distribute huge quantities of imagery. Such organizations may need to keep catalogs of a huge number of images, provide access to subsets of the images as services, and quickly create products for distribution. With ArcGIS Image Server, not only can the user easily manage large quantities of imagery and its attributes, but the required products can also be defined as dynamic services available for timely access or processed for conventional distribution.
- Environmental organizations need to process, manage, and compare many different types of imagery. In environmental applications, there are often requirements to handle many different image sources with different dates, spectral characteristics, and resolutions. With ArcGIS Image Server, such imagery can be accessed as multiple services for viewing in a GIS or other applications.

ArcGIS Image Server Architecture

The ArcGIS Image Server architecture is similar to the ArcGIS Server architecture and is composed of several components as outlined in the diagram below:



The ArcGIS Image Server components can be organized into three main parts:

- authoring,
- serving,
- use.

Server-Based Image Processing

A key feature of ArcGIS Image Server is its ability to perform server-based image processing and thereby create multiple imagery products for different applications from a single source without the redundancy of multiple datasets or long preprocessing times.

The processing can be broken down into three key types:

- Radiometric processes, which define how the pixel values are displayed, such as band combinations or enhancements
- Geometric processes, which define the location of the pixels
- Mosaic methods, which define how the overlapping images are handled A large range of processing options are implemented with user-definable process chains.

Implementing ArcGIS Image Server

A key advantage of ArcGIS Image Server is that it can be set up quickly. Most users can install and have large image services running within half a day. Installation of the authoring component is added as an extension to ArcMap™.

The process of creating an image service can be performed step by step or by using a wizard. The location for storing the image service is first defined as well as the type of image service such as color, pan, or elevation. The user is prompted to specify the type and location of the raster to be added. The type defines how georeferencing and metadata about the rasters will be extracted. The location can be a set of individual files or a directory containing multiple subdirectories. The authoring component extracts all the properties and metadata about the rasters into the image service definition, which consists of a database table with a single record for each raster that is linked to a set of properties associated with each raster. Multiple rasters from different sources can be added to the same image service definition. If the rasters do not contain sufficient overviews, image service overviews can be defined that enable faster access to the image service at small scales. Properties of the image services, as well as processes to be applied to individual rasters or the complete image service, may be defined. A build process is available to compute properties that are derived from the rasters such as the boundary of the image service or creation of overviews. Prior to publishing, the image service definition is compiled. The compilation process converts the open data structures into a compact and optimized form for publishing. As the image service definition does not contain the actual pixel values, it is small in size. By working within ArcMap, the authoring component has access to all the extensive functionality including editing of the database and geometry such as footprints and seamlines.

The server component is small and easy to install. It does not require any third-party database or Web server. ArcGIS Image Server can utilize existing imagery on disks or networks, eliminating the need for long or costly data conversion. Most users can install and have large image services running within half a day.

To publish an image service, the Server Manager component is used. This provides the user interface to create a server as well as one or more service providers if required on multiple machines. By adding the compiled image service definition to the Server Manager, image services are published and immediately made available to client applications. The system is dynamic in that the compiled service definition may be updated at any time without affecting the image services. If a compiled image service definition is updated, the revised image service can become immediately available to users.

Customizing ENVI with IDL

ENVI is a widely used and well respected Remote Sensing Data analysis application. Anyone working with imagery or raster data has probably encountered ENVI, even if just by name, at some point in their career. ENVI's major strength lies in it's robust analytical capabilities, giving it's users fine grained control through each step of their analysis, as well as it's ease of use and intuitive interface. ENVI has a wide array of tools for spatial and spectral analysis that are typically combined in an overall workflow that scientists, analysts, and production staff use to meet their needs in getting information from their imagery.

However, in the world of scientific analysis, off the shelf products like ENVI often don't provide the necessary, specific functionality that a scientist needs to analyze the data they have. Many applications do 90% of the work a scientist needs, but fall just short of their overall application needs. To do their specific analyses, many scientists thusly have to create their own tools outside of the software applications they use. To achieve this end, the common approach is to pick a programming language that best suits the skills of the scientist and the needs of the analysis.

A variety of programming tools exist that all have benefits and drawbacks. Languages like C and Fortran can be very powerful and performant if written correctly, but require a certain level of expertise and a fair amount of code to do even simple tasks because they are low level languages. Other options like JavaScript or Perl are higher level scripting languages and thus far easier to use, but are much more restricted in their computing and optimization power and their overall functionality.

Intermediate options exist between these two, such as Java or IDL. These languages are interpreted and typically are far easier to learn and develop applications in because they don't require tasks like memory management. IDL has even greater benefits because it also does not require typing or casting of variables which can significantly speed up the process of application development, particularly in the prototype or R&D phase, and it has a large library of routines in place for scientific data analysis and visualization.

Combining the large array of prepackaged analytical tools already available in ENVI with the programming power offered by IDL makes the ENVI+IDL platform and incredibly powerful platform for customized imagery analysis. ENVI can be extended or modified with IDL in several ways including access to an extensive analytical API, the ability to modify the user interface, access to the ENVI GUI elements, and the capability to use ENVI's library in batch mode for production work or large, predefined processing tasks.

Overview of IDL

IDL (the Interactive Data Language) is a complete computing environment for the interactive analysis and visualization of data. IDL integrates a powerful, array-oriented language with numerous mathematical analysis and graphical display techniques. Programming in IDL is a time-saving alternative to programming in FORTRAN or C.

Using IDL, tasks which require days or weeks of programming with traditional languages can be accomplished in hours. You can explore data interactively using IDL commands and then create complete applications by writing IDL programs.

Analysis advantages include:

- Many numerical and statistical analysis routines—including Numerical Recipes routines—are provided for analysis and simulation of data. Compilation and execution of IDL commands provides instant feedback and hands-on interaction.
- Operators and functions work on entire arrays (without using loops), simplifying interactive analysis and reducing programming time.
- IDL's flexible input/output facilities allow you to read any type of custom data format.

Visualization advantages include:

- Rapid 2D plotting, multi-dimensional plotting, volume visualization, image display, and animation allow immediate observation of your computation's results.
- Support for OpenGL-based hardware accelerated graphics.

Application development advantages include:

- IDL is a complete, structured language that can be used interactively and to create sophisticated functions, procedures, and applications.
- IDL's Intelligent Tools (iTools) can be customized with your own operations or data manipulations.
- IDL widgets can be used to quickly create multi-platform graphical user interfaces to your IDL programs.
- Existing FORTRAN and C routines can be dynamically-linked into IDL to add specialized functionality. Alternatively, C and FORTRAN programs can call IDL routines as a subroutine library or display engine.
- IDL programs run across all supported platforms (UNIX, Macintosh and Microsoft Windows) with little or no modification. This application portability allows you to easily support a variety of computers.

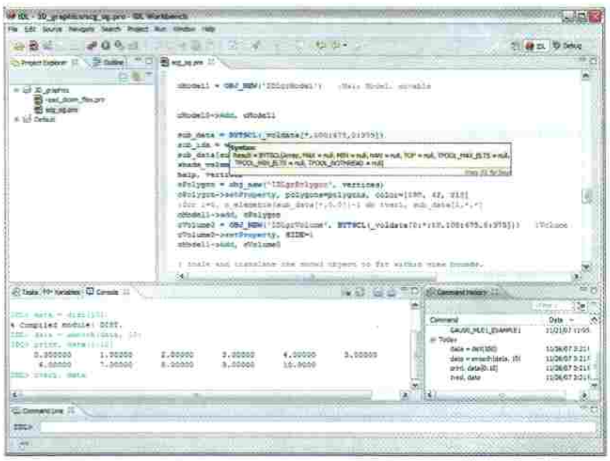


Figure 1: *A view of the IDL Workbench*

The ENVI API

Like IDL, ENVI has a library of built-in routines. In fact, there are over 200 documented routines in the ENVI library and it grows with each release. They encompass almost all of the functionality provided in the interactive ENVI program. Each library routine is written in the form of an IDL procedure or function, and is called as such. A complete index of these routines as well as a full reference page for each is located in the ENVI Online Help.

ENVI Library Routines

Library routines are IDL-based functions and procedures that you call from an IDL or ENVI command line (or incorporate into a user function or batch mode routine) that encompass nearly all of the functionality in ENVI. For example, the library routine MATH_DOIT lets you perform Band Math on a spatial dataset, just like you would by selecting Basic Tools – Band Math from the ENVI main menu bar. The ENVI library routines encompass programmatic access to a large collection of processing elements ranging from spectral analysis, region/area of interest processing, map projection utilities, object analysis, reporting, and visualization components. The ENVI Reference Guide contains a complete index and full reference page for each library routine.

Most of ENVI's library routines require user interaction. When writing your own code to call ENVI library routines, you must explicitly handle all aspects of a library routine. As a result, most of the ENVI library routines require many more keywords than a typical IDL routine. Because so much information often must be passed into an ENVI library routine, they typically use keywords instead of positional parameters, to prevent you from having to pass information in a specific sequence.

Performing a linear sequence of ENVI processing tasks in a non-interactive manner is called batch mode. You can write a batch mode routine (an IDL program) and call it from the ENVI menu system to perform the tasks, or you can start batch mode from the IDL command line. Batch mode uses the ENVI_DOIT library routine, which provides the processing portion of a user function without requiring any user interaction. Running ENVI in batch mode is no different than working in an ordinary IDL session, except that you can use various ENVI library routines. To access these library routines, you must restore them into the IDL session's memory.

```
ENVI_OPEN_FILE, fname, /NO_REALIZE, R_FID=fid
if (fid eq -1) then began
envi_batch_exit
print, 'error encountered: file invalid'
return
endif
ENVI_FILE_QUERY, fid, nb=nb, ns=ns, nl=nl
dims = [-1, x0, x1, y0, y1]
pos = indgen (nb)

ENVI_DOTT, 'ENVI_FX_DOTT', FID=fid, DIMS=dims, POS=pos, $
BR_BANDS=[2,3],$
CONF_THRESHOLD=0.20, $
MERGE_LEVEL=merge_level,$
RULESET_FILENAME=ruleset_name, $
SCALE_LEVEL=scale_level, $
VECTOR_FILENAME=vector_filename
ENVI_BATCH_EXIT
```

e 2: *Some Sample ENVI Library Code*

To run a batch mode routine, start by creating a user function that contains the necessary ENVI program calls and appropriate parameters. Then run it using one of the following options:

- From the ENVI menu system, which allows you to link a combination of processes and start them from a single menu option
- From the IDL command line (assuming you have purchased ENVI + IDL), which allows you to perform common processing steps on various files outside of interactive ENVI. This capability can be useful in several cases: if you are primarily working in IDL but occasionally need to use ENVI routines; if you want to write user functions that combine your own IDL code with ENVI routines; or if you need to do a large amount of ENVI processing without any user interaction (for example, go home while the ENVI processing is performed overnight).

ENVI Interface Elements

ENVI Menu Files

The ENVI main menu bar (defined by envi.men) and Display group menu bar (defined by display.men) are configurable items located in the menu subdirectory of the ENVI installation. These two ASCII files outline the placement of menu buttons, pull-down menus, and separators. They also define the procedure called when you select the menu item. You can reposition menu items or add new items, depending on your needs and preferences. ENVI does not distinguish between ENVI and user-event handlers, which ensures that user events are easily integrated. You can also use the ENVI_

DEFINE_MENU_BUTTON procedure to add menu items (buttons) to the ENVI menu system automatically through your own code.

Figure 2: *The ENVI menu with buttons added*

Using ENVI widgets to collect input in your user functions is much easier than adding widgets to an ordinary IDL program because there is no need to write your own event-handling procedures to manage the widget events; ENVI auto-manages the widget events for you. In addition, ENVI's special compound widgets are included in the library of ENVI routines, making it easy to create user functions that have the same look-and-feel of ENVI. ENVI's auto-managed widgets allow you to create user functions that fit seamlessly into ENVI.

When a widget interface for a user function is auto-managed by ENVI, the GUI is always modal. That is, the widget interface blocks the rest of ENVI from responding until you select the OK or Cancel button, either of which destroys the GUI (OK destroys and proceeds, and Cancel destroys and returns). In this mode, ENVI handles all of the widget events and conveniently returns the user input in a structure variable. Using ENVI to auto-manage the GUI in this fashion allows user functions to take a very simple form, where they can execute linearly from the beginning of the file to the end.

Compiling

After writing a custom routine (user function, interactive user routine, or custom file reader), you should place the resulting .pro or .sav file in the save_add directory of your ENVI installation. This allows the routine to be automatically compiled or restored when ENVI is started. Use only lowercase names (including extensions) for files placed in the save_add directory. You can change the location of the save_add directory, as desired, in your ENVI preferences or configuration file.

As an alternative, you can compile .pro files within ENVI only if you have ENVI + IDL, by selecting File – Compile IDL Module from the ENVI main menu bar. This allows you to debug the routine during development. If you have standalone ENVI, you must use a compiled (.sav) file to add a user function to ENVI.

Custom File Input

You can write a custom file input routine to open and read your data format on-the-fly. When opening an unsupported file format automatically (without prompting for the file information), the input routine parses the file header and places the bands in the Available Bands List. Custom readers can access data stored in unsupported storage formats on-the-fly in ENVI, without converting to an ENVI format.

Conclusion

ITT Visual Information Solutions recognizes the importance of giving users the power to customize and extend ENVI to meet their specific needs. Leveraging the power of IDL, along with access to the extensive analytic library of ENVI, allows users to create the functionality their application requires that can not be found in COTS products and to easily integrate this into the ENVI environment.

To learn more about ENVI features and functionality and more about customizing ENVI with IDL, visit http://www.ittvis.com/ProductServices/ENVI.aspx

In Conversation With

Prof. N Vinod Chandra Menon

Former Member
National Disaster Management Authority

Prof. N. Vinod Chandra Menon is an alumnus of Kerala University and Jawaharlal Nehru University, New Delhi, and has participated in training programmes at Cranfield University, UK and the Institute of Development Studies, Sussex. He has attended a six weeks training on Disaster Management in Russia, participated in the Global Training of Trainers Program of UNICEF at New York on Emergency Preparedness and Response and attended the United Nations Joint Logistics Centre (UNJLC) Training at Brindisi, Italy.

Prof. Menon has worked in the Economics Area of the Indian Institute of Management, Ahmedabad and in the Information Centre on Development-Policy Modelling (ICDM) supported by the IDRC, Canada at Systems Research Institute, Pune. Since 1986, he worked as Associate Professor (Economics and Planning) at Maharashtra Institute of Development Administration (MIDA), Pune and from 1996 as Professor (Disaster Management) at the Yeshwantrao Chavan Academy of Development Administration (YASHADA), Pune. While working as the Professor at the Centre for Disaster Management at YASHADA, Pune, he coordinated the preparation of state and district disaster management plans, the setting up of a state-wide satellite-based Emergency Operations Centre network and the preparation of spatial and non-spatial overlays of ARCINFO-based geographic information system covering 43,000 villages of 35 districts of Maharashtra.

In August 2002, Prof. Menon joined the UNICEF India Country Office in charge of emergency preparedness and response. He coordinated the UNICEF response to floods in several states, drought in Rajasthan, post-earthquake rehabilitation efforts in Gujarat and the Indian Ocean Tsunami in the affected states and Union territories, including Andaman & Nicobar islands. He has been a Member of the United Nations Disaster Management Team in India, UNICEF Country Management Team and the Operations Group.

Prof. Menon was nominated as a Member of the High Power Committee (HPC) on Disaster Management Plans set up by the Government of India in 1999. He has worked as Consultant to the World Bank, UNDP, UNICEF and ADPC, Bangkok on Disaster Management related projects. He has published scores of articles, papers and chapters in books on disaster management. Prof. Menon has participated and presented papers at several International Conferences in USA, UK, Germany, Thailand, Nepal, Italy, Japan, Guatemala, Panama, Switzerland, Norway, Republic of Korea, Sweden, Turkey, China, etc.

In August 2005, Prof. Menon was nominated as a Member of the newly constituted National Disaster Management Authority (NDMA) headed by the Hon'ble Prime Minister of India. He served as Member, NDMA from September 2005 to September 2010.

Q. What are the major Disasters that have been affecting our nation in the recent past?

Apart from the annual recurring phenomenon of floods in several parts of the country, India is also vulnerable to other natural hazards like earthquakes, cyclones, drought and landslides. The Bhopal gas leak tragedy in 1984 exposed the potential risk in chemical industrial units which handle hazardous materials. The Indian Ocean Tsunami in December 2004 also caused enormous loss of lives and damage to assets, infrastructure and property in the coastal districts of Kerala, Tamil Nadu, Andhra Pradesh, Puducherry and Andaman and Nicobar Islands. In the last two decades, India has also witnessed several man-made disasters like serial bomb blasts caused by terrorists and militant groups.

Q. What are the initiatives taken by National Disaster Management Authority (NDMA) to reduce the risks caused by these natural and human induced hazards?

A significant initiative by the National Disaster Management

Authority (NDMA) during the Eleventh Five Year Plan period has been the mainstreaming of disaster management in development planning, in consultation with the Ministry of Finance and the Planning Commission. This was done with the objective of ensuring disaster risk reduction in all plan proposals by Ministries and Departments of the Government of India and State Governments by mandating self-certification by the officials initiating the proposals that the multi-hazard risk and vulnerability of the region where the proposed infrastructure is expected to be established has been taken into consideration and that the proposals have incorporated appropriate disaster-resilient features and higher specifications to withstand the impact of disasters.

Another major contribution was the formulation of the National Policy on Disaster Management (NPDM) which was approved by the Cabinet in October 2009. NDMA has also prepared several Guidelines on the Management of Earthquakes, Tsunamis, Floods, Cyclones, Landslides and Snow Avalanches, Urban Flooding, Chemical (Industrial) Disasters, Chemical, Biological, Radiological and Nuclear Emergencies and on cross-cutting themes like Medical Preparedness and Mass Casualty Management, Incident Response System, Psycho Social Care and Mental Health Support in Disasters and the Role of NGOs in Disaster Management.

NDMA has also prepared several mitigation projects like the National Cyclone Risk Mitigation Project (NCRMP), National Earthquake Risk Mitigation Project (NERMP), and the National School Safety Project. Mitigation projects for effective management of floods, landslides, etc. are also being prepared.

NDMA has also conducted hundreds of mock exercises in several parts of the country with the help of various stakeholder groups. The establishment of the National Disaster Response Force (NDRF) as a well trained and well-equipped dedicated first responder force has been another significant achievement of NDMA.

Q. What major role does NDMA plays when it comes to collating geo-information for Disaster Management across the country?

The coordination of geo-spatial data capture by agencies like the National Remote Sensing Centre (NRSC), National Spatial Data Infrastructure (NSDI) and the establishment of the National Database on Emergency Management (NDEM) is facilitated by NDMA for creating a National Disaster Management Information System (NDMIS). NDMA has also set up Task Forces for streamlining the disaster risk assessment and vulnerability analysis in the country. The criteria for carrying out micro-zonation has also been standardised with the help of technical experts.

Q. How successful has NDMA been in bringing various stakeholders like governments, industry and scientific community onto one platform for Disaster Management? How does it work together with these sectors?

NDMA played the role of a facilitator in bringing together the various stakeholder agencies to create a consensus on the priorities for chalking out a road map for working towards a disaster-resilient India. NDMA's officials are permanent invitees to the meetings of the National Executive Committee (NEC), headed by the Union Home Secretary, and the National Crisis Management Committee (NCMC) headed by the Cabinet Secretary, consisting of Secretaries of key Ministries of the Government of India. NDMA has also facilitated interactions with the corporate sector and established a National Corporate Task Force on Disaster Management. However, more efforts are required to create the synergy and shared values among these critical stakeholder groups. The challenge is to evolve a consensus on the roles which these agencies have to play in strengthening disaster preparedness, disaster risk reduction and mitigation rather than continuing to play the role of providing relief supplies during the emergency response phase.

Q. GIS is an effective tool for planning and informed decision making. Do you think that this tool is being effectively used by various stakeholders of the system

In the past two decades, there has been an increasing awareness on the use of GIS as an effective tool for planning and informed decision making by many agencies dealing with various aspects of delivery of services. However, most agencies are only using GIS as a tool for representing spatial and thematic data. This is very much akin to using the computer like a modern typewriter, primarily for word processing. There is a need for exploring the full potential of the GIS in activities like the WebEOC, scenario analysis and modeling, developing models for forecasting and early warning to identify possible inundation boundaries in flood and storm-surge prone areas, developing Digital Elevation Models, and overlays of remote sensing information before, during and after disasters. The industry needs to design orientation workshops and Executive Round Tables to sensitise senior decision makers on these potential areas and disseminate best practices in e-governance using GIS.

> **"The industry needs to design orientation workshops and Executive Round Tables to sensitise senior decision makers on these potential areas and disseminate best practices in e-governance using GIS."**

Q. How do you think the GIS technology can significantly contribute to managing disasters in the next few years?

The agencies mandated to deal with disaster management at the national, state and district levels need to be more tech savvy to create geo-spatial Data Bases with socio-economic, demographic and thematic data overlays and develop the competencies to use the data by adding value to create information and knowledge for informed decision making.

Q. What are the challenges you see in putting geospatial technologies to use for Disaster Management?

The need to standardize on formats to use the base maps in different shape files to converge on an integrated geo-spatial data base, the competencies to develop scenario analysis and modeling, development of appropriate applications for deploying remote sensing for forecasting and early warning, the need to sensitise decision makers to appreciate the potential advantages in creating an enabling environment for putting geo-spatial technologies for more effective disaster management and finally the need to create a consensus on a contemporaneous map policy which is forward looking and sensitive to ameliorate the sufferings of the disaster-prone communities are important challenges which need to be addressed on priority.

Near Real-Time Flood Mapping using Radar Images in the State of Assam

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Introduction

Floods are probably the most recurring, widespread, disastrous and frequent natural hazards of the world. India is one of the worst flood-affected countries, being second in the world after Bangladesh and accounts for one-fifth of global death count due to floods. About 40 million hectares or 1/8th of the India's geographical area is flood-prone. As a country governed by monsoon climate, India is subjected to repeated flood disaster. The River Brahmaputra with steep gorges and rapids in Arunachal Pradesh entering Assam, becomes a braided river (at times 10 mi/16 km wide) and with tributaries, creates a flood plain. During monsoon, the River Brahmaputra discharges a large volume of water and at the same time brings in huge amounts of sediments. The width of the river varies from 3 km to 18 km, but the average width is about 10 km. The width /depth ratios for individual channels of Brahmaputra vary from 50:1 to 500:1. The gradient of the river in Bangladesh is 0.000077, decreasing to 0.00005 near the confluence with the Ganges. The river has a total suspended load discharge of about 725 million tons per annum.

Flood in Assam is characterized by their extremely large magnitude, high frequency and extensive devastation (Figure-1). This natural hazard repeats itself year and not only costs lives but also leaves the economy of the state, which is largely agricultural, in utter shambles. Therefore there is urgency for monitoring and mapping the flood phenomenon and to provide the administrative authorities with the real-time, accurate 'flood inundation maps'.

CDAC, Pune has carried out the present study for mapping the flood inundation in the district of Lakhimpur, Assam State, enabling the administrative authorities to plan for mitigation activities in real-time.

Satellite remote sensing has the potential in flood inundation mapping. Optical imageries are used routinely for flood mapping, but may be unavailable due to cloud cover. The unique advantage of radar remote sensing compared to optical remote sensing is that it has all-weather capability and can penetrate clouds to acquire imagery. RADARSAT-1 (C-Band) has a revisit time of 24 days; hence the evolution of flooding and its monitoring can be achieved. The satellite has a swath width of 50-500 km range offering wide aerial coverage, essential for mapping floods in one of the largest river basins of the world. The HH-polarization images of RADARSAT-1 produce noticeably stronger accuracy in the mapped result.

In the present study, flood inundation maps of Lakhimpur district have been generated from SAR (Synthetic Aperture Radar) images of RADARSAT-1 satellite, using ENVI Radar Module and IDL. The Near Real-Time Flood Monitoring System is a Geographic Information System (GIS), which has the capability of providing quick and easy access to large volumes of data. GIS provides added quality and improved efficiency in updating maps. Creating a Flood Inundation Map by using GIS is a pre-requisite to generate a Flood Hazard Map, which is a vital component for the appropriate land-use planning of flood-prone areas. With the help of this system, easily-read, rapidly-accessible charts and maps can be prepared which will facilitate the administrators and planners to identify areas of risk and prioritize their mitigation/response efforts. This system takes SAR images (Raster) as input and delineates water features and generates a flood inundation layer (Vector). This vector layer can be overlaid on village and road layers to visualize flood inundation scenario.

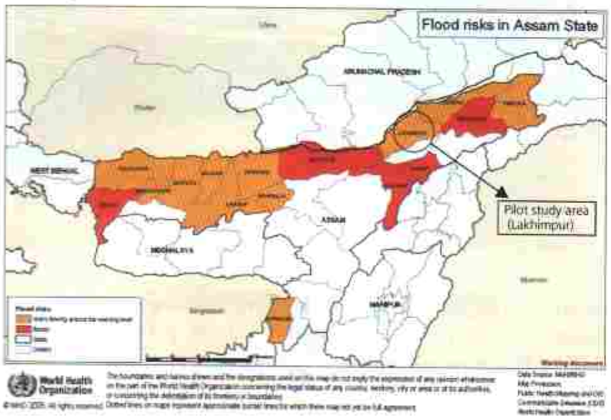


Figure 1: *Flood risks in Assam State (Figure credits: World Health Organisation)*

ENVI Radar Module supports many SAR sensors and file formats. It also has an exhaustive filter set for processing SAR images.

Study Area

Lakhimpur is one of the most flood-affected districts of Assam State. Situated in the north-east corner of Assam, Lakhimpur district falls between latitudes 26°45'00" N and 27°30'00" N and longitudes 93°30'00" E and 94°30'00" E, with a total area of 2277 sq.km. It is bounded on the north by Siang and Papumpare District of Arunachal Pradesh and on the east by Dhemaji District and Subansiri River. Majuli Sub Division of

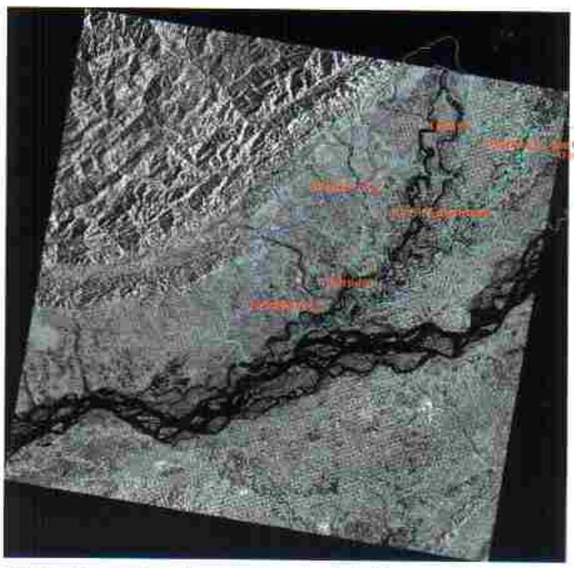
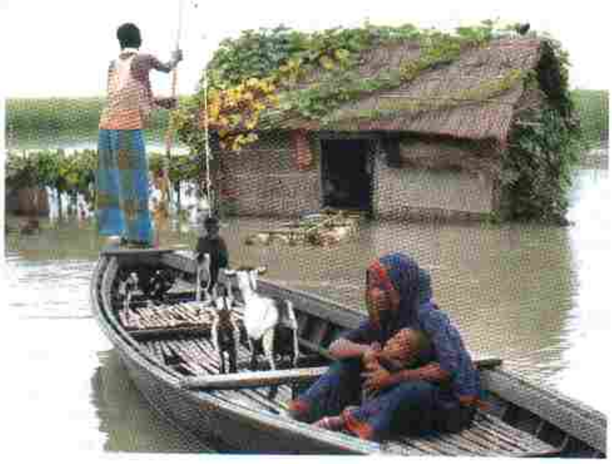


Figure 2: *Pre-flood SAR image with Lakhimpur boundary overlaid*



Jorhat District stands on the southern side and Gahpur sub division of Sonitpur District is on the West. A pre-flood SAR image with Lakhimpur district boundary is shown in Figure-2.

Methodology

The emphasis in this study is the simplicity and robustness of the algorithms (ENVI Radar Module) used for water feature delineation from SAR images and efficient implementation of the system using IDL. The SAR image was acquired for the Brahmaputra basin in Assam State to map the flood on 17 July 2003. The proposed method is applied to RADARAST-1 Standard SAR scene (Spatial resolution = 25 m), HH-polarized.

The SAR image was filtered to remove speckle. The filtered image was transformed using a Logarithm function and simple thresholding applied to delineate water features (Figure-3).

The following inferences were made while using ENVI and IDL for Flood Mapping from RADARSAT-1 SAR Data:

1. Linking Multiple Displays is a unique capability of ENVI, which enables interactive visual inspection/change detection of multitemporal radar images. This facility helped in comparing the speckle in proximity to features of interest, which in turn helped in choosing the window size for filtering.
2. This module has a utility to view Header Information of Radar Data in readable form, which otherwise is not readable when opened in WordPad/Notepad.
3. Separate Zoom window [4x] is readily available to ease viewing details for Georeferencing and other image manipulations, as SAR data is a bit tricky in the Georeferencing process.
4. Adaptive Filters in this module is quiet an attraction for the following pros as compared with other packages;
   - Filter Size can be more than 3x3 which is a limitation in other packages, which helped in deciding the optimum window size.
   - Noise model can be specified by user, giving more accuracy in filtering.
   - Noise Characteristics can be specified by user, giving more accuracy in filtering.

   The above features enabled to use larger window sizes and appropriate noise model characteristics yielding better despeckling of water features.
5. Local Sigma and Bit Errors filtering are unique to ENVI RADAR Module, which are not available in other packages.
6. Texture Filters available with other packages are not as comprehensive as in ENVI.
7. With IDL we can use most of ENVI functionalities programmatically.
8. One can easily import and export the image as a variable between ENVI and IDL.
9. IDL also has a large data input and output formats' support which reduces the programming time further.

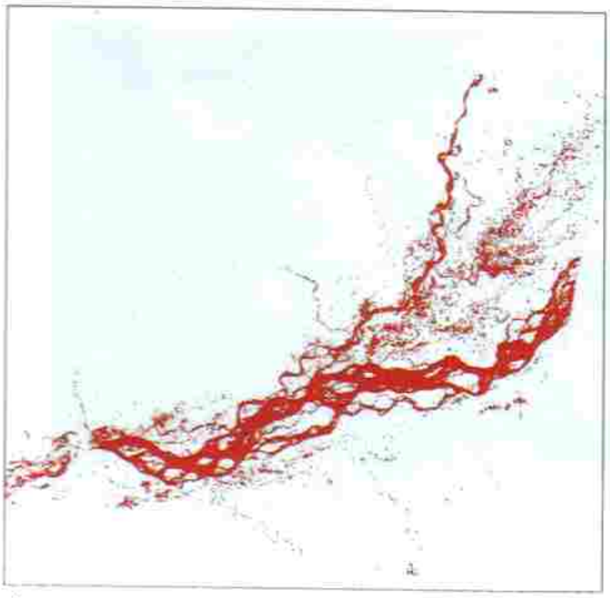


Figure 3: *Threshold water features (and shadows) on July 17, 2003 image*

The Filter Size (Window size) of Texture Filters is unlimited, whereas other packages offer only a few window sizes to choose from. This feature gave the freedom of choosing the optimum texture window size for delineating River Feature Texture (Homogeneity).

Conclusion

The study shows the robustness and efficiency of the algorithms in ENVI and effectiveness of IDL. The system was implemented using IDL and the run-time was approximately 8 minutes, making the system useful for near real-time applications.

References

1. www.banglapedia.org
2. Canadian Remote Sensing Agency (CRSA)
3. http://assamgovt.nic.in/

Working with ArcGIS Viewer for Flex

The ArcGIS Viewer for Flex is a ready to deploy configurable client application built on the ArcGIS API for Flex. It is ESRI's solution for creating customized GIS enabled Web mapping applications, without requiring programming. It is designed to work with ArcGIS Server and ArcGIS Online Web services.

Overview

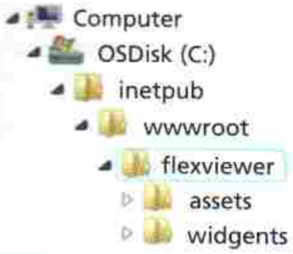
- Ready to deploy GIS Web client mapping application for ArcGIS Server built on the ArcGIS API for Flex.
- Easily configurable to meet custom business needs and requirements - no programming skills required to deploy.
- Viewer functionality is defined by widgets - many core widgets are included.
- New functionality can be created with custom widgets developed using the ArcGIS API for Flex

Requirements

- A Web browser (e.g., Firefox 3.6, Internet Explorer 8).
- A Web server running on the machine where ArcGIS Viewer for Flex will be installed (e.g., IIS). Ask your systems administrator to verify your machine has a Web server running.
- OPTIONAL: Access to ArcGIS Server Standard or Advanced editions; if you want to add your own Web services. The Flex Viewer generally supports ArcGIS Server 9.3 and above, but certain functionality, like web editing and support for time-aware data requires version 10 or above of ArcGIS Server.

Part 1. Download the ArcGIS Viewer for Flex package

1. Click the download link on the Web page containing the download package i.e. from http://resources.arcgis.com/ content/arcgis-flex-viewer-how-to-download; agree to the ESRI Attribution and License Agreement, then click Download and save the ZIP file anywhere on your machine.
2. Unzip the download package file; it will create a new folder called flexviewer.
3. Place the flexviewer folder into your machine's Web server folder. The actual folder location may be different depending on your Web server configuration, but the most common on Windows OS machines is probably: "C:\inetpub\wwwroot" (when using IIS).



NOTE: You will need write permissions to this folder. Depending on your operating system and user privileges, you might have to ask your systems administrator for assistance.

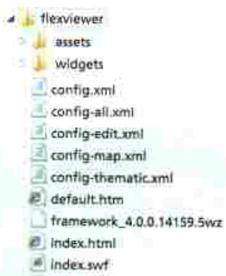
4. Open a Web browser and test the ArcGIS Viewer for Flex application by entering the following URL (do not include the quotes): "http://<machinename>/flexviewer/index.html". Substitute <machinename> with the name of your machine (e.g.,http://mymachinename/ flexviewer/index.html).

The ArcGIS Viewer for Flex application should appear in your Web browser. The graphic below shows the Viewer application (default appearance) with some of its key user interface components labeled:

Part 2. Configuring the ArcGIS Viewer for Flex

1. Finding the files

Minimize the Web browser and navigate back to the flexviewer folder location on your machine. (e.g., "C:\inetpub\wwwroot\flexviewer"). Expand the folder to view its contents.



The flexviewer folder contains:

- Assets folder - Contains resources such as icons and graphics used by the application.
- Widgets folder - Contains widgets used by the application.
- Various XML configuration files for the Viewer application.
- ESRI license agreement document.
- Other supporting files for the application.

2. Change titles, logo and style colors in config.xml

Open config.xml in a text editor such as Notepad or TextPad. Leave the Viewer application open in the Web browser.

Change the title, subtitle, logo, and colors XML tag values:

Change...

```
<title>ArcGIS Viewer for Flex</title>
<subtitle>... using ArcGIS</subtitle>
<logo>assets/images/logo.png</logo>
<style>
 <colors>0xFFFFFF,0x333333,0x101010,0x000000,0xFFD700</colors>
</style>
```

to this:

```
<title>My Flex Viewer</title>
<subtitle>Sample configuration</subtitle>
<logo>assets/images/i_solar.png</logo>
<style>
<colors>0xCEE7F4,0x39628C,0x355D89,0x294867,0xCEE7F4</colors>
</style>
```

Save the config.xml file (but leave it open) and refresh the Viewer application to observe the changes you just made.

NOTE: You will need to clear your cache to make sure the Web browser has the new version of the file.

3. Change the initial extent

Change the initial spatial extent of the map so when the Viewer application opens, the map is zoomed to Australia. Edit the <map> tag's initialextent property to:

```
<map initialextent="12042000 -5619000 17795000 -952000" top="40">
```

Save the config.xml file (but leave it open) and refresh the Viewer application to observe the changes you just made. The Viewer's map display should now zoom to the new spatial extent you specified.

4. Add your data as an operational layer

Add a <layer> to <operationallayers>:

```
<layer label="Boundaries and Places" type="tiled" visible="false"

url="http://server.arcgisonline.com/ArcGIS/rest/services/Reference/World_Boundaries_and_Places_Alternate/MapServer"/>
```

Note: if this service is not running in the same web server, your ArcGIS Server will need a crossdomain.xml file. If your ArcGIS Server map service has not been cached (i.e. not "tiled"), then use type="dynamic"

5. Add a widget

Next, you will add a widget to enable new functionality in the Viewer. Scroll about halfway down the file, until you see a <widgetcontainer> tag. This section of the config.xml file contains the widgets for the Viewer widget tray. Add the following XML code to the bottom, right above </widgetcontainer>:

```
<widget label="Traffic Camera"

icon="assets/images/i_camera.png"

config="widgets/Query/QueryWidget_Louisville_TrafficCams.xml"

 url="widgets/Query/QueryWidget.swf"/>
```

How to Add Widget in FLEX API – Step by Step

The Data Extract Widget

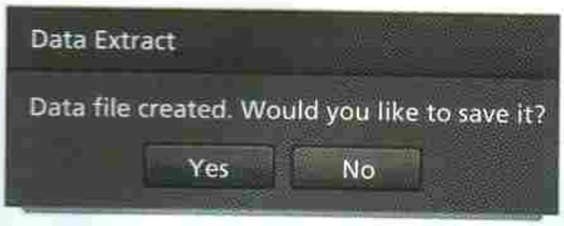
This widget enables end users to select a subset of data from the visible data content in the Viewer application's map display, and download it locally onto the client machine as a zip file. End users define the data subset by specifying an area of interest. Behind the scenes, it works with a "Clip and Ship" geoprocessing service.

a. Workflow

1. Define an area of interest (to extract data) using one of the area boundary creation tools (from left to right):
   - polygon
   - freehand polygon
   - rectangle
   - circle
   - ellipse
2. If the defined area is not correct, it can be discarded by clicking Clear.
3. Select data layers of interest to extract (based on your GP service) using the checkboxes.
4. Select data format of extracted data (based on your GP service) from the dropdown list.
   - Available formats include:
   - File geodatabase (.gdb)
   - Shapefile (.shp)
   - Autodesk AutoCAD (.dxf)
   - Autodesk AutoCAD (.dwg)
   - Bentley Microstation Design V8 (.dgn)

Click Extract.

The Data Extract dialog will appear, prompting the end user to specify a location for saving the data subset.



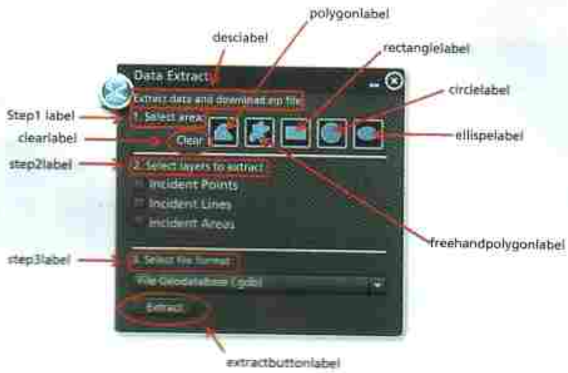
The extracted data will be saved locally as a zip file named extractedData.zip.

b. Conceptual Workflow

Requires: a feature service (to extract data from) and a geoprocessing service (that performs the 'clip and ship' functionality).

- Takes an input defined area of interest.
- The geoprocessing service does the following:
  - Applies it to the selected layers to extract data.
  - Gets the feature data from the feature service.
  - Formats the feature data into the selected data format and zips it up, making it available for download.

c. Description of the Data Extract Widget



d. Setting up your own Data Extract service

This widget leverages the "Clip and Ship" functionality from ArcGIS Desktop. Read about GP Service example: "Clip and ship" in the ArcGIS Desktop help documentation, to learn more about setting up your own server with a data extraction service. Some points to keep in mind when creating your own GP service:

- Your GP service must be published as "Asynchronous".
- Your GP service must expose at least these 3 input parameters (with these exact names):
  - Area_of_Interest
  - Layers_to_Clip
  - Feature_Format

e. Data

The study area for this example is a small area in the city of Portland, Oregon. Data includes places, transportation networks, hydrologic features, land records, and a hillshade raster of the study area. The data can be found in C:\arcgis\ArcTutor\GP Service Examples\ClipAndShip\ToolData\Portland.gdb.

f. Publishing

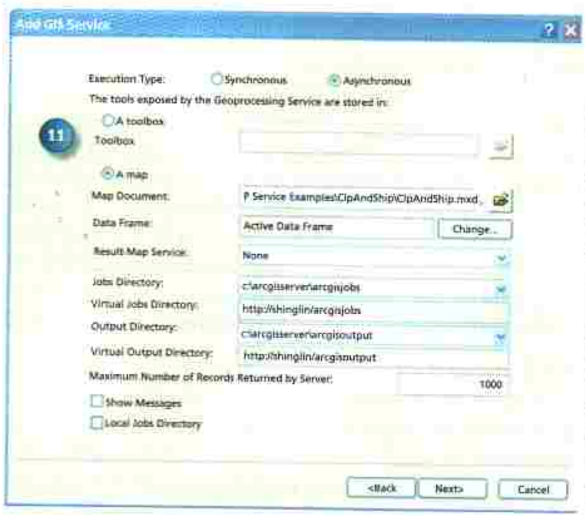
Steps:

You need to have an administrative connection to an ArcGIS server to publish services. To create an administrative connection, in the Catalog window, go to GIS Servers > Add ArcGIS Server and check Manage GIS Services. On the General panel, enter theServer URL and Host Name, then click Finish. A server administrative connection with the host name will appear under GIS Servers.

- From the Catalog window, navigate to C:\arcgis\ArcTutor\GP Service Examples\ClipAndShip.
- Right-click Portland.mxd and select Publish to ArcGIS Server.
- In the first window, keep all defaults and click Next.
- in the next panel, deselect all check boxes except Mapping (always enabled). Click Next.
- Click Finish. The map service Portland will be published to the ArcGIS Server. You will use it as a basemap later.
- Open C:\arcgis\ArcTutor\GP Service Examples\ClipAndShip\Portland.mxd in ArcMap.
- In the Catalog window,
  a. Expand Toolboxes > System Toolboxes > Server Tools.tbx > Data Extraction > Extract Data Task.
  b. Drag the Extract Data Task tool to the ArcMap table of contents.

The tool layer Extract Data Task appears in the table of contents.

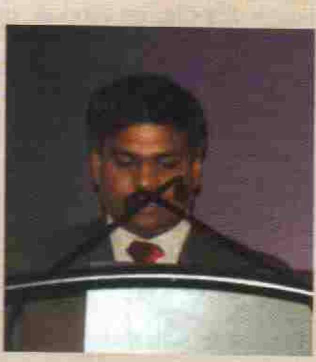
- Save the map document containing the tool layer as ClipAndShip.mxd.
- In the Catalog window, right-click the connection to your ArcGIS Server and select Add New Service.
- In the Add GIS Service panel, type ClipAndShip as the service name and select Geoprocessing Service as the Type. ClickNext.
- In the next panel, check A Map as your source file. Enter the path to the ClipAndShip.mxd map document that you created above and click Next.



- For any remaining panels, leave the default value and click Next until the last panel, where you click Finish. You should see the service ClipAndShip under your ArcGIS Server connection.

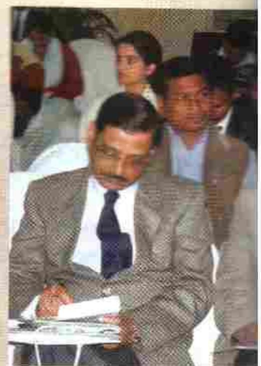
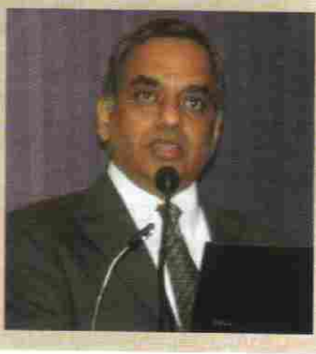
Esri India's GeoVision

Evangelizing the use of Geospatial Tools







Geographic Information System (GIS) is today no longer a niche technology used by some. GIS or Geospatial Technology has become a mainstream IT application area and the adoption of GIS to improve the acquisition, management and analysis of geospatial data is mandatory in most National Projects today like R-APDRP, JNNURM, NLRMP, etc. Various national programs as well as corporate business houses today leverage geospatial technology for better governance and decision making. Esri is the technology leader worldwide in the field of GIS and Geospatial solutions. Its ArcGIS suite of software solutions provides GIS solutions from the desktop to the server to the handheld devices to the cloud.

The importance of Imagery and Image Analysis has been core to GIS. Studying and analyzing Images from satellites, aircraft, etc., are essential in creating the basic framework for GIS Applications. ITT Visual Information Solutions has been one of the leaders in providing Image Analysis solutions through their ENVI & IDL suite of products. They have a close integration with Esri's suite of software giving ArcGIS users the ability to access ENVI tools for analyzing geospatial imagery directly from within the ArcGIS desktop and server environments. NIIT GIS Limited is the sole distributors for the entire Esri and ENVI Product suite and Services in India, Nepal & Bhutan.

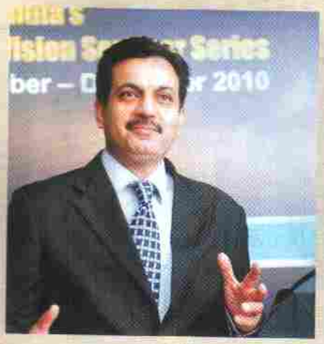
To bring forth the value of new technology trends, NIIT GIS Limited, known by its brand name Esri India, had organized 1-day seminars, Esri India's GeoVision Seminar Series, across the 13 cities for an invited audience of senior officers and thought leaders. This was to evangelize the use of GIS tools and acquaint users of the benefits they get by using this technology in their applications. They also showcased the latest advancements in Esri's ArcGIS ver 10 and its seamless interconnectivity ITT VIS's ENVI.

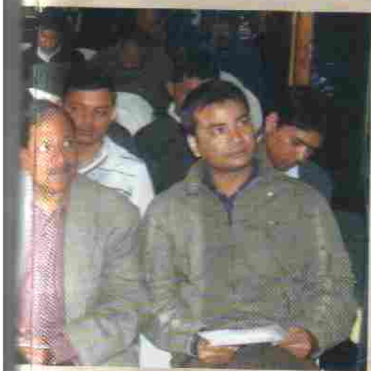
Explaining the rationale behind these Seminars, Mr. Rajesh C Mathur, Vice Chairman, NIIT GIS Limited, said "Today 80 percent of our decisions have geographic dimensions. GIS is playing a crucial role in every aspect of our life. Development is putting a lot of pressure on infrastructure. GIS provides us a comprehensive approach in planning and decision making. Our attempt through the seminar is also to demonstrate the power of the new ver 10 of Esri's ArcGIS and its close integration with our Image Processing product from ITT VIS called ENVI."

The highlight of the Seminar Series was the talks given by reputed users from different fields. Dr. YVN Krishna Murthy from NRSC, Dr. G.S.Rao from Lavasa, Prof. Gosain from IIT

Seminar Series









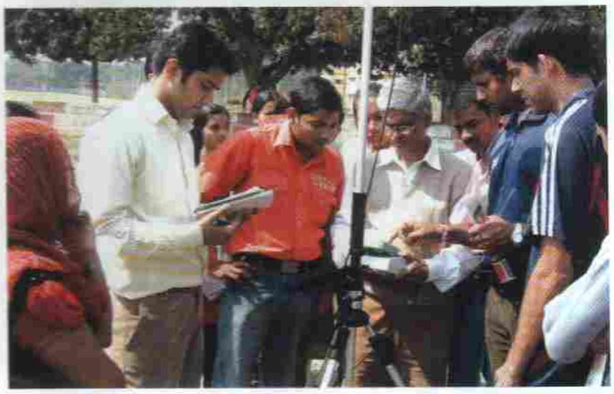

Delhi, Dr.P.Nag from NATMO, and other distinguished users shared their experiences with the audience on how they have used GIS tools in their applications thus giving the audience a user's perspective of the technology. Mr. S.Subba Rao, Surveyor General of India, Maj. Gen. R. C. Padhi, DDG Military Survey, Mr. Uday Kale, Vice President, Reliance Infrastructure, Dr.V.S.Ramamurthy, Director NIAS & Former Secretary DST, among others enhanced the value of this series by their presence at these Seminars.

The Theme of the Seminar was 'GIS - opening the world to everyone'. Speaking on the same, Mr. S.Sridhar, President & COO, NIIT GIS Limited, said "Over the past couple of years, we have seen tremendous strides made in the communication and the devices technology along with the rapid evolution of web and cloud computing. Esri's GIS technology has kept pace with these developments and have enabled Geospatial information to be integrated seamlessly into the enterprise Information System, thus making it easier for the decision makers to take more informed decisions. In India too, we have seen tremendous interest in adapting to this new paradigm and I am sure over the next couple of years, we will have many more geospatially enabled Information Systems implemented in different organizations"

There were some special moments during the Seminar Series. At Bangalore during the Seminar, Esri's Special Achievement in GIS (SAG) Award for the year 2009 was presented to Karnataka State Natural Disaster Management Centre (KSNDMC) for their use of GIS technology to disburse information about Natural Disasters affecting the state of Karnataka. Dr. V.S. Prakash, Director, KSNDMC, received the award on behalf of the organization. Another event celebrated was the completion of 14 Years of service to the GIS fraternity by NIIT GIS Limited. The event was celebrated with the cutting of the cake by Mr. Rajesh Mathur, Vice Chairman, NIIT GIS limited and Mr. S.Sridhar, President & COO< NIIT GIS Limited, along with their senior management team.

The seminar covered not only the larger Metros but also smaller towns like Nagpur, Bhopal, Dehradun, Lucknow, Ahmedabad, Chandigarh and Guwahati, as today GIS has reached every nook and corner of the country. The response to the Seminar series was tremendous and Esri India feels that it has met the goal with which they are being organized. The Seminar Series started on October 28th at Hyderabad and ended on December 22nd at Guwahati.

Remote Sensing and GIS in Department of Geography Banaras Hindu University



Introduction

BHU, one of the largest Central Universities in India, now ranked first (India Today's Survey—May 31, 2010--of India's Best Universities) among Indian Universities has about 140 individual departments (under 3 institutes and 16 faculties), one of which is Department of Geography. The Department of Geography in the Faculty of Science offers B.A./B.Sc. (Hons.) and M.A./M.Sc. Geography with many specializations, one of which is remote sensing and GIS.

With the initiative taken and efforts put in by Prof.K.N.Prudhvi Raju, in the year 2008 the Department of Geography has started a one year PG Diploma Special Course in Remote Sensing and GIS with an intake of 40 students (20 seats at BHU's Varanasi Main Campus + 20 seats at BHU's Rajiv Gandhi South Campus at Barkachcha). This particular diploma course is designed to generate man-power in the fields of image processing and GIS; hence, the emphasis is more on providing hands-on practical training to the students in latest image processing and GIS softwares. So far, two batches of students (75 in number) who have passed this course have all been placed in good positions in many private companies.

Geomatics Course & Facility

The course is so designed as to give sufficient theoretical background to the students on remote sensing, GIS and GPS and simultaneously put them on practical training. Some of the contents of the course are like this—fundamentals of geomorphology and cartography, remote sensing and GIS, advances and applications in remote sensing, GIS and GPS. The course is of two semesters with three theory papers and two practicals in each of the semesters along with project/ dissertation work during the second semester. The students are engaged in various 'live projects' and are paid under university's "earning while learning" programme.

The course is supported by two image processing and GIS laboratories with state of the art facilities--50 computers, two servers, one 36" colour scanner, one 42 inch 4 color designjet printer, ESRI's ArcInfo/GIS software, ERDAS Image Processing software, AutoCAD, ENVI Image Processing software, iGIS image processing and GIS software of ScanPoint Geomatics, Leica's GX 1230+ RTK DGPS and TS02-7 Total Stations. So far, all of the students have opted for ESRI's ArcInfo/GIS and ERDAS softwares for training purpose. Apart from three specialized and qualified teachers, the course is supported by eminent visiting faculty and specialists from IITs and other Training Institutes including private companies.

Eligibility

Admission is open to graduates and post-graduates of geography, geology and geo-physics and other branches of science, engineering and technology. For admission details look for BHU's Admission Notification (normally issued in the second week of January every year) in all leading English and Hindi News Papers.

For More Details Contact
Prof.K.N.Prudhvi Raju,
Co-ordinator, Special Course
Department of Geography,
Banaras Hindu University, Varanasi-221005;
E-mail: prudhvigeobhu@gmail.com;
Phones: 09935346553/0542-26701388.

Snippet Code for Displaying Dynamically the Legends of Features

The following code snippet is a server based logic for displaying dynamically the legend of features visible in the map viewer.

```
protected void Page_PreRender(object sender, EventArgs e)
 {
ESRI.ArcGIS.ADF.Web.Geometry.Envelope final_adfEnvelope = mapAPDRP.Extent;
string updateLegend = getInitialLegends(final_adfEnvelope);
 }
public string getInitialLegends(ESRI.ArcGIS.ADF.Web.Geometry.Envelope final_adfEnvelope)
{
ESRI.ArcGIS.ADF.Web.Geometry.Envelope Initial_adfEnvelope = (ESRI.ArcGIS.ADF.Web.Geometry.Envelope)Session["InitialExtent"];
 if (final_adfEnvelope != Initial_adfEnvelope)
{
Session["LegendPath"] = null;
picturebox.ImageUrl = "";
updtPan.Update();
getLegend();
if (Session["LegendPath"] != null)
{
picturebox.ImageUrl = Session["LegendPath"].ToString();
}
else
{
picturebox.ImageUrl = "~/Legends/NoLegend.bmp";
}
updtPan.Update(); // update the Panel............
}
return Map1.CallbackResults.ToString();
}
public void getLegend()
{
ESRI.ArcGIS.ADF.Web.DataSources.IMapFunctionality mapFunctionality = null;
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapResourceLocal gisresource = null;
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapFunctionality ags_MapFunctionality = default(ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapFunctionality); mapFunctionality = ESRI.ArcGIS.ADF.Web.DataSources.IMapFunctionality)Map1.GetFunctionality(Map1.PrimaryMapResource);
gisresource = mapFunctionality.Resource as ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapResourceLocal;
ags_MapFunctionality = (ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapFunctionality)mapFunctionality;
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapResourceLocal ags_MapResourceLocal = (ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.MapResourceLocal) ags_MapFunctionality.Resource;
ESRI.ArcGIS.Server.IServerContext serverContext = ags_MapResourceLocal.ServerContextInfo.ServerContext;
ESRI.ArcGIS.ADF.ArcGISServer.MapDescription mapDesc = ags_MapFunctionality.MapDescription;
ESRI.ArcGIS.Carto.IMapServerObjects iMapServerObjects = ags_MapResourceLocal.MapServer as ESRI.ArcGIS.Carto.IMapServerObjects;
ESRI.ArcGIS.Carto.IMap iMap = iMapServerObjects.get_Map(ags_MapResourceLocal.DataFrame);
ESRI.ArcGIS.Carto.IMapServer mapServer = (ESRI.ArcGIS.Carto.IMapServer)serverContext.ServerObject;
IMapDescription iMapDesc = default(IMapDescription);
iMapDesc = mapServer.GetServerInfo(mapServer.DefaultMapName).DefaultMapDescription;
mapDesc.MapArea.Extent = ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.Converter.FromAdfEnvelope(Map1.Extent);
string urlLegend = null;
urlLegend = Session["urlLegend"] as string;
int legendImageHeight = int.Parse(System.Configuration.ConfigurationManager.AppSettings["LegendImageHeight"]);
 if (urlLegend != "")
{
urlLegend = GetLegend(Map1, 300, legendImageHeight, 96, "Legend");
}
if (Session["imgName"] != null)
{
updtPan.Update();
}
}
public string GetLegend(ESRI.ArcGIS.ADF.Web.UI.WebControls.Map map, int width, int height, int printResolution, string legendTitle)
{
Bitmap legendImage = null;
DbInteraction dbInteraction = null;
dbInteraction = new DbInteraction();
int count = 0;
OracleDataReader reader10 = null;
string errStr = "";
#region "Trying to get the legend information"
Dictionary<string, KeyValuePair<string, CartoImage>> legendInfo = new Dictionary<string, KeyValuePair<string,
```

ArcScripts

ArcScripts

```
CartoImage>>();
int layerCounter = 0;
foreach (IMapResource item in
map.MapResourceManagerInstance.GetResources()
)
{
// just in case one of the map services isn't
working, or if the map resource is invisible,
skip to next resource
IMapTocFunctionality mtoc =
item.CreateFunctionality(typeof(IMapTocFuncti
onality), Guid.NewGuid().ToString()) as
IMapTocFunctionality;
if (mtoc == null)
continue;
if (!this.Map1.InitializedFunctionalities)
{ this.Map1.InitializeFunctionalities(); }
IMapFunctionality mf = null;
foreach (IGISFunctionality entry in
item.Functionalities)
{
if (entry is IMapFunctionality)
mf = entry as IMapFunctionality;
}
if (mf == null ||
!mf.DisplaySettings.Visible)
continue;
string ddlListedBox =
dbInteraction.GetStringFomXML("LegendLayers")
;
IMapFunctionality mMapFunc = null;
string[] layerIDs = null;
string[] layerNames = null;
string PrimRes = map.PrimaryMapResource;
IGISResource GisRes = null;
// find the IMapFunctionality for nyc_main
map service
foreach (IMapFunctionality tmp in
map.GetFunctionalities())
{
if (tmp is
ESRI.ArcGIS.ADF.Web.DataSources.Graphics.MapF
unctionality) continue;
GisRes = tmp.Resource;
if (GisRes.Name == PrimRes)
{ mMapFunc = tmp; break; }
}
ArrayList presentLayers = new ArrayList();
string[] items = ddlListedBox.Split(new
char[] { ',' });
ESRI.ArcGIS.ADF.Web.DataSources.IMapFunctiona
lity mapFunctionality =
ESRI.ArcGIS.ADF.Web.DataSources.IMapFunctiona
lity) mMapFunc;
ESRI.ArcGIS.ADF.Web.DataSources.IGISResource
gisResource = mapFunctionality.Resource;
ESRI.ArcGIS.ADF.Web.Geometry.Envelope
adfEnvelope = map.Extent;
bool supported =
gisResource.SupportsFunctionality(typeof(ESRI
.ArcGIS.ADF.Web.DataSources.IQueryFunctionali
ty));
if (supported)
{
ESRI.ArcGIS.ADF.Web.DataSources.IQueryFunctio
nality queryFunctionality
=(ESRI.ArcGIS.ADF.Web.DataSources.IQueryFunct
ionality)
gisResource.CreateFunctionality(typeof(ESRI.A
rcGIS.ADF.Web.DataSources.IQueryFunctionality
), null);
mapFunctionality.GetLayers(out layerIDs, out
layerNames);
for (int j = 0; j < items.Length; j++)
{
int layerIndex = 0;
for (int i = 0; i < layerNames.Length; i++)
{
if (layerNames[i].ToLower() ==
items[j].ToLower().ToString())
{
layerIndex = I;
break;
}
}
string LayerName = layerNames[layerIndex];
if (LayerName.ToUpper() != "ROUTE")
{
if (queryFunctionality.Resource is
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.
MapResourceBase)
{
ESRI.ArcGIS.ADF.ArcGISServer.EnvelopeN
agsSoapEnvelope;
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.
MapFunctionality agsMapFunctionality =
(ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer
.MapFunctionality)mMapFunc;
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.
MapResourceBase agsMapResource =
(ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer
.MapResourceBase)queryFunctionality.Resource;
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.
MapResourceLocal agsMapResourceLocal =
(ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer
.MapResourceLocal)queryFunctionality.Resource
;
ESRI.ArcGIS.Server.IServerContext
serverContext =
agsMapResourceLocal.ServerContextInfo.ServerC
ontext;
ESRI.ArcGIS.ADF.ArcGISServer.MapDescription
agsSoapMapDescription =
agsMapFunctionality.MapDescription;
ESRI.ArcGIS.ADF.ArcGISServer.MapLayerInfo[]
agsSoapMapLayerInfoArray =
agsMapResource.MapServerInfo.MapLayerInfos;
ESRI.ArcGIS.ADF.ArcGISServer.MapLayerInfo
activeAgsSoapMapLayerInfo =
agsSoapMapLayerInfoArray[layerIndex];
ESRI.ArcGIS.ADF.ArcGISServer.LayerDescription
[] agsSoapLayerDescriptionArray =
agsSoapMapDescription.LayerDescriptions;
ESRI.ArcGIS.ADF.ArcGISServer.LayerDescription
```

```
activeAgsSoapLayerDescription =
agsSoapLayerDescriptionArray[layerIndex];
if (activeAgsSoapLayerDescription == null)
{ throw new Exception("active layer is
null"); }
else
{
ESRI.ArcGIS.ADF.ArcGISServer.SpatialFilter
agsSoapSpatialFilter = new
ArcGIS.ADF.ArcGISServer.SpatialFilter();
agsSoapEnvelope =
ESRI.ArcGIS.ADF.Web.DataSources.ArcGISServer.
Converter.FromAdfEnvelope(adfEnvelope);
agsSoapSpatialFilter.FilterGeometry =
agsSoapEnvelope;
string geometryFieldName = null;
foreach (ESRI.ArcGIS.ADF.ArcGISServer.Field
agsSoapField in
activeAgsSoapMapLayerInfo.Fields.FieldArray)
{
if (agsSoapField.Type ==
ESRI.ArcGIS.ADF.ArcGISServer.esriFieldType.es
riFieldTypeGeometry)
{
geometryFieldName = agsSoapField.Name;
break;
}
}
agsSoapSpatialFilter.GeometryFieldName =
geometryFieldName;
agsSoapSpatialFilter.SubFields = "OBJECTID";
agsSoapSpatialFilter.SpatialRel
=ESRI.ArcGIS.ADF.ArcGISServer.esriSpatialRelE
num.esriSpatialRelIntersects;
ESRI.ArcGIS.ADF.ArcGISServer.MapServerProxy
agsSoapMapServerProxy =
agsMapResource.MapServerProxy;
ESRI.ArcGIS.ADF.ArcGISServer.FIDSet
selectionAgsSoapFIDSet =
agsSoapMapServerProxy.QueryFeatureIDs(agsSoap
MapDescription.Name, layerIndex,
agsSoapSpatialFilter);
count =
selectionAgsSoapFIDSet.FIDArray.Length;
if (count != 0)
{
string[] stringfids = new string[count];
int x = 0;
foreach (int elem in
selectionAgsSoapFIDSet.FIDArray)
{ stringfids[x++] = elem.ToString(); }
string result = string.Join("' OR OBJECTID=
'", stringfids);
dbInteraction.GetConnection(dbInteraction.Get
StringFromXML("DBConnection"));
reader11 =
dbInteraction.GetDataReader("select
distinct(SUBTYPEID) from " + LayerName + "
where OBJECTID = '" + result + " '", ref
errStr);
string subtype = "";
try
{
while (reader10.Read())
{
string sub =
Convert.ToString(reader10.GetInt32(0));
subtype += sub + "|";
}
}
catch (Exception kx)
{ kx.ToString(); }
presentLayers.Add(LayerName + ":" + subtype);
}
}
}
}
}
}
if (presentLayers == null)
{
Map1.CallbackResults.Add(new
CallbackResult(null, null, "javascript",
"alert('Please select atleast one layer from
the TOC which is available in current map
extent.');"));
return "";
}
TocDataFrame[] tocDataFrames =
mtoc.GetMapContents(mf.Name,
WebImageFormat.PNG24, true, false);
foreach (TocDataFrame tocDataFrame in
tocDataFrames)
{
foreach (TocLayer tocLayer in tocDataFrame)
{
// check layer here that it is present in map
extent or no.......................
for (int p = 0; p < presentLayers.Count; p++)
{
string[] Lsubtype =
presentLayers[p].ToString().Split(new char[]
{ ':' });
if (tocLayer.Name == Lsubtype[0].ToString())
{
if (tocLayer.Visible)
{
List<KeyValuePair<string, CartoImage>>
legends = GetLegendInfo(tocLayer,
Lsubtype[1].ToString());
if (legends != null && legends.Count > 0)
{
foreach (KeyValuePair<string, CartoImage>
entry in legends)
{
legendInfo.Add(layerCounter.ToString(), new
KeyValuePair<string, CartoImage>(entry.Key,
entry.Value));
layerCounter++;
}
}
```

ArcScripts

```
}
}
}
}
}
}
#endregion
#region "Create the legend dynamically"
if (legendInfo != null && legendInfo.Count > 0)
{
int legendWidth = width;
int legendHeight = height;
int marginPadding = 10;
int legendEntryPadding = 5;
legendImage = new Bitmap(legendWidth, legendHeight);
legendImage.SetResolution(printResolution, printResolution);
Graphics graphics = Graphics.FromImage(legendImage);
Font stringFont = new Font("Verdana", 8, System.Drawing.FontStyle.Bold);
SolidBrush drawBrush = new SolidBrush(System.Drawing.Color.Black);
List<Bitmap> legendEntries = new List<Bitmap>();
foreach (KeyValuePair<string, KeyValuePair<string, CartoImage>> item in legendInfo)
{
if (item.Value.Value != null)
{
Bitmap swatch = new Bitmap(new System.IO.MemoryStream(item.Value.Value.MimeData.Bytes));
float swatchColumnWidth = (swatch.Width * printResolution / swatch.HorizontalResolution)) > 100 ? 100 : swatch.Width * (printResolution / swatch.HorizontalResolution));
SizeF textSize = graphics.MeasureString(item.Value.Key, stringFont, (int)(legendWidth - swatchColumnWidth - (marginPadding * 2)));
float inidividualHeight = (swatch.Height * printResolution / swatch.VerticalResolution)) > textSize.Height ? (swatch.Height * printResolution / swatch.VerticalResolution)) : textSize.Height;
Bitmap individuallegend = new Bitmap(legendWidth, (int)inidividualHeight);
individuallegend.SetResolution(printResolution, printResolution);
Graphics g = Graphics.FromImage(individuallegend);
g.DrawImage(swatch, marginPadding, 0);
RectangleF textArea = new RectangleF(swatchColumnWidth + marginPadding, 0, legendWidth - swatchColumnWidth - (marginPadding * 2), inidividualHeight);
```

```
g.DrawString(item.Value.Key, stringFont, drawBrush, textArea);
g.Dispose();
legendEntries.Add(individuallegend);
}
else
{
SizeF textSize = graphics.MeasureString(item.Value.Key, stringFont, (int)(legendWidth - (marginPadding * 2)));
if (textSize.Height > 0)
{
float inidividualHeight = textSize.Height;
Bitmap individuallegend = new Bitmap(legendWidth, (int)inidividualHeight);
individuallegend.SetResolution printResolution, printResolution);
Graphics g = Graphics.FromImage(individuallegend);
RectangleF textArea = new RectangleF(marginPadding, 0, legendWidth - (marginPadding * 2), inidividualHeight);
g.DrawString(item.Value.Key, stringFont, drawBrush, textArea);
g.Dispose();
legendEntries.Add(individuallegend);
}
}
}
Font legendTitleFont = new Font("Verdana", 10, System.Drawing.FontStyle.Bold);
SizeF legendTitleArea = graphics.MeasureString(legendTitle, legendTitleFont);
float currentY = 0;
 //Add title to the legend
graphics.DrawString("Legend", legendTitleFont, drawBrush, marginPadding, legendEntryPadding);
currentY += legendTitleArea.Height + marginPadding;
//Add the individual legend entries
foreach (Bitmap entry in legendEntries)
{
if ((currentY + entry.Height) < legendHeight)
{
graphics.DrawImage(entry, 0, currentY);
currentY += entry.Height + legendEntryPadding;
}
}
graphics.Dispose();
}
#endregion
string imgName = "Legend" + numberDiv + ".bmp";
try
{
```

```
legendImage.Save(Request.PhysicalApplicationPath + "Legends\\" + imgName); }
catch (Exception hx)
{ hx.ToString(); }
numberDiv++;
Session["LegendPath"] = "~/Legends/" + imgName;
return imgName;
}
private List<KeyValuePair<string, ESRI.ArcGIS.ADF.Web.CartoImage>> GetLegendInfo(TocLayer tocLayer, string subtypes)
{
string[] subtypecount = subtypes.Split(new char[] { '|' });
//Get dumy SubtypeCode..........
string Groupcount = "1,2,3,4,5,6,7,8,9,10";
string[] symGroup = Groupcount.Split(new char[] { ',' });
List<KeyValuePair<string, CartoImage>> legends = new List<KeyValuePair<string, CartoImage>>();
if (tocLayer != null && tocLayer.Visible)
{
if (tocLayer.TocSymbolGroupCount > 0)
{
if (tocLayer.TocSymbolGroupCount == 1)
{
TocSymbolGroup symbolGroupSingle = tocLayer.GetTocSymbolGroup(0);
//Looks like there is no way to differentiate between a layer with a simple single symbol and a layer with a group symbol with only one entry
//So, if we encounter a group symbol with only one entry, assume it is a simple single legend
//This actually does not make a difference for people reading the map as both should mean the same thing
//The ESRI ADF TOC control works the same way
if (symbolGroupSingle.Count == 1)
{
TocSymbol tocSymbol = symbolGroupSingle[0];
legends.Add(new KeyValuePair<string, CartoImage>(tocLayer.LayerName, tocSymbol.Image));
}
else
{
System.Collections.IEnumerator e = tocLayer.GetTocSymbolGroups();
//add the layer name
if (e.MoveNext() && e.Current != null)
legends.Add(new KeyValuePair<string, CartoImage>(tocLayer.LayerName, null));
e.Reset();
while (e.MoveNext())
{
//Add the group name
TocSymbolGroup symbolGroup = e.Current as TocSymbolGroup;
legends.Add(new KeyValuePair<string, CartoImage>(symbolGroup.Heading, null));
foreach (TocSymbol tocSymbol in symbolGroup)
{
//add group entries
legends.Add(new KeyValuePair<string, CartoImage>(tocSymbol.Label, tocSymbol.Image));
}
}
}
}
else
{
System.Collections.IEnumerator e = tocLayer.GetTocSymbolGroups();
if (e.MoveNext() && e.Current != null)
legends.Add(new KeyValuePair<string, CartoImage>(tocLayer.LayerName, null));
e.Reset();
while (e.MoveNext())
{
TocSymbolGroup symbolGroup = e.Current as TocSymbolGroup;
if (symbolGroup.Heading == "SUBTYPECD")
{
//check if symbolGroup.Heading is SUBTYPECD then it will enter into loop...............
legends.Add(new KeyValuePair<string, CartoImage>(symbolGroup.Heading, null));
_subtypeLoopCount = 1;
int i = symbolGroup.Count;
foreach (TocSymbol tocSymbol in symbolGroup)
{
for (int j = 0; j < subtypecount.Length; j++)
{
if (Convert.ToString(_subtypeLoopCount) == subtypecount[j].ToString())
{
legends.Add(new KeyValuePair<string, CartoImage>(tocSymbol.Label, tocSymbol.Image));
}
}
_subtypeLoopCount++;
}
}
}
}
}
}
return legends;
}
```

ArcScripts

Esri

Global Page

Hawaii Builds Broadband Coverage Maps with Esri Technology

The State of Hawaii recently launched an interactive broadband mapping Web site based on Esri technology. Visitors to the site will be able to view broadband coverage throughout the state. The Hawaii Department of Commerce and Consumer Affairs (DCCA) is continuing to collect and verify data related to availability, speed, and location of broadband services in Hawaii.

The Hawaii Broadband Map Web site will be an important resource for consumers in Hawaii, enabling them to identify and choose from the growing number of broadband services that are becoming available in the state.

Hawaii's broadband coverage maps are built with BroadbandStat, an application developed by Esri that enables the user to map information from a variety of sources and provide a visual way of exploring the results.

States can use the collected data to pinpoint where the expansion of new broadband services will support local economic development. The data is also a useful resource for policy makers, grant writers, and companies doing broadband investment research. Internet access to the maps gives the public a way to find information about broadband services in their area and give feedback, whether to report observations about the data or comment on their own broadband access and experience.

Twelve U.S. states and the territory of Puerto Rico will be using BroadbandStat to organize their broadband services data and make interactive maps available on the Internet. These activities are supported by more than $20 million in State Broadband Data and Development Grant Program funds that were made available through the Department of Commerce's National Telecommunications and Information Administration (NTIA) and the American Recovery and Reinvestment Act of 2009 for improving broadband accessibility across the nation.

For more information about BroadbandStat, visit esri.com/bbstat . View the Hawaii Broadband interactive map at hibroadbandmap.org.

Ushahidi and Esri Team to Improve Crisis Mapping Services

Partnership Enhances Ushahidi Web Platform with Extensive GIS Data, Advanced Analytic Tools

Esri recently announced a partnership with Ushahidi that will improve the collection and use of crowd-sourced information during large-scale emergencies. Ushahidi is a nonprofit organization that allows local observers to submit reports to the Ushahidi Web platform using their mobile phones or the Internet during a crisis. Esri is providing software, services, and training to support Ushahidi's Web platform. The result is better information more readily accessible by decision makers and the public.

Both victims and witnesses of a crisis or disaster can request assistance or report conditions using text messaging capabilities from their personal phone or Internet-enabled device. These reports are collected, geo-referenced and then mapped on Ushahidi's web-based map. Esri and Ushahidi will now work together to make this information available to more people, including those using Esri geographic information system (GIS) technology. This will provide access to Ushahidi information to relief and response organizations that use GIS analysis and modeling for humanitarian response and relief.

"Ushahidi has provided an invaluable information service during crisis events, such as the Haiti earthquake, by supplying a social media platform to capture and communicate critical information for response and relief services," says Russ Johnson, director of public safety solutions, Esri. "Esri wants to support these efforts by making available GIS tools that assist in analyzing, displaying, and publishing critical information on the Ushahidi platform."

"Our strategic relationship with Esri represents an important step forward for our combined user base," says Patrick Meier, director of crisis mapping at Ushahidi. "Esri's technology will provide Ushahidi users with access to extensive GIS data and advanced analytical tools. Esri users will also have the ability to contribute to Ushahidi mapping efforts in more seamless ways and use this data for further analysis."

Ushahidi, which is Swahili for "testimony" or "witness," first established itself by developing a Web site created in the aftermath of Kenya's disputed 2007 presidential election. The site collected eyewitness reports of violence sent in by e-mail and text messages and placed them on maps. The free and open-source software platform developed for the site has since been improved and used for a number of events. For instance, in the aftermath of the Haiti earthquake, thousands of people sent text messages for help. That information was mapped and used by emergency responders to provide needed resources quickly where they were needed most.

For More Information Visit Http://www.esri.com or http://www.ushahidi.com/