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Arc India News

Esri India Magazine

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Cover Story

GIS for Proactive, Intelligence - Led
and Informed Policing

Case Study

Better Policing
Through Analysis

Technical Article

GIS for Real - Time
Crime Centers

The cover illustration features a large, red, stylized handprint in the center. The background is a map with various colored overlays (red, yellow, green) indicating crime hotspots or zones. At the bottom, there are yellow and black diagonal stripes with the text "CRIME SCENE DO NOT CROSS" repeated. The main title "Crime & Law Enforcement with GIS" is written in large, yellow, sans-serif font across the lower half of the cover.

Crime & Law
Enforcement
with GIS

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Today, public safety, both in urban and rural areas, is one of the key security issues confronting India. Crime in general and specifically against women is growing. India also remains highly vulnerable to acts of domestic terrorism.

Law enforcement agencies, however, remain constrained with the resources available to them. Studies indicate that India has on an average 129 police officers per 100,000 people. This ranks India as second lowest among 50 countries ranked by the United Nations Office on Drugs and Crime (UNODC) in 2010 where the global average is approximately 350. According to NCRB, total incidence of violent crimes has increased by 65 percent in 2012 over the previous year. Government with its spending and policy initiatives, thus, has a herculean task to bridge the increasing gap between the growth and control of internal security challenges in a sustainable way.

Leveraging technology advancements is the way forward to ensure public safety and increase law enforcement effectiveness with finite resources. Geographic Information System (GIS) technology is being used globally as a powerful crime prevention and investigation tool for managing crime in a very effective way.

The government has already approved a police modernization plan (spread over 2013-17) with an outlay of over USD 2 billion which covers various programs such as megacity policing, city surveillance project, Crime Criminal Technology Networking Systems (CCTNS) which have significant applications of GIS technology. However, public's access to local and national crime data maps needs to be further enhanced which will impact GIS in crime mapping. And public/private partnerships need to be enhanced by the development of industry-specific information-sharing frameworks e.g. to link theft victims in crime verticals to law enforcement specializing in the investigation of such crimes.

GIS and related technological advancements offer an immense future potential. The coming years will see a convergence of technologies related to GIS — Global Positioning Systems (GPS), advanced analytics, predictive modeling, and the Internet — that will allow crime data to be analyzed in near real time and will help predict future activities of criminals.

Law enforcement agencies need imbibe use of technology in their day-to-day mission of protecting citizens, ensuring officer safety, and serving the community. With a definitive GIS roadmap in place by all the law enforcement agencies, we can expect higher adoption of geo spatial tools in all aspects of public safety and law enforcement thus building a safer environment for all.

Agendra Kumar

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Designed by:

Esri India appoints Agendra Kumar as President



New Delhi, September, 2013: NIIT Technologies Ltd., a leading global IT solutions organization today announced the appointment of Mr. Agendra Kumar as the President of its joint venture subsidiary NIIT GIS Ltd (Esri India).

Speaking on the appointment Arvind Thakur, CEO NIIT

Technologies Ltd said, "GIS is revolutionizing the way we live and work and Esri India is a leading provider of Geospatial technology. With Agendra joining our leadership team, we look forward to strengthen our leadership position in the market".

Agendra has over 25 years of experience in IT business management and has served as the country head of several multinational technology companies. In his last assignment Agendra was the Managing Director of SGI in India. He has been associated twice with SGI (earlier known as Silicon Graphics Inc) with a prior stint as Director, Sales during 1994-2000. In between he worked as Managing Director of Veritas India and upon its merger with Symantec Corporation took on global account management responsibilities for Asia Pacific and Japan region.

Agendra Kumar, President, NIIT GIS Ltd said, "I'm privileged to lead the business at Esri India which is the No 1 brand in GIS technology. I look forward to bring to the market the many innovations in order to evangelize GIS anywhere and everywhere." Agendra holds M.Sc. (Hons.) in Mathematics and Master of Management Studies degrees from BITS Pilani.

Esri noted as a leader in 2013 Technology Innovation Award for LocationAnalytics

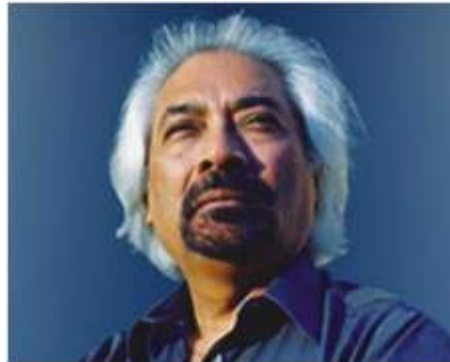
Esri was recently awarded the IT Innovation Award at the 2013 Technology Innovation Awards announced by Ventana Research, US. The awards recognize technology vendors who have introduced innovations in technology to advance business and IT. The awards distinguish pioneers that have developed clear visionary and transformative technology. The Technology Innovation Awards showcase what technology vendors have done to advance the potential of their applications and technology that enable to drive better productivity and outcomes.

Esri was awarded for its technical innovation in the field of Location Intelligence for its product Esri Maps. Location Analytics provides data visualization and geographic intelligence for business analytics systems. Esri Location Analytics integrates geography with existing business systems and processes: Valuable resources are saved through integrating with in place systems; a new visualization and analytic capability is added to in place systems providing new perspective on data.

Adviser to Prime Minister of India speaks at Esri International User Conference

Sam Pitroda Discusses India's Technology Revolution Sam Pitroda is Adviser to Prime Minister of India Dr. Manmohan Singh for Public Information Infrastructure and Innovation.

July 2013: Sam Pitroda, Adviser to Prime Minister of India Dr. Manmohan Singh for Public Information Infrastructure and



Innovation, highlighted India's efforts to solve twenty-first-century challenges with geospatial technology during the opening session of the Esri

International User Conference in San Diego, California, on July 8, 2013.

Pitroda is an internationally respected development thinker, policy maker, telecom inventor, and entrepreneur who has spent nearly 50 years in information and communications technology (ICT) and related human and national developments. During his tenure as Adviser to Prime Minister Rajiv Gandhi in the mid-1980s, Pitroda led six technology missions covering telecommunications, water, literacy, immunization, dairy production, and oil seeds. He currently serves as the chairman of the Smart Grid Task Force Committee to reform public broadcasting, modernize railways, deliver e-governance, and perform other developmental activities.

"We are honored and humbled to have a revolutionary leader like Mr. Pitroda share his story and vision at the Esri UC," said Esri president Jack Dangermond. "His story of empowering India's vast rural population with better information and access to government services truly demonstrates how geospatial technology can transform our world and make life safer, healthier, and more fulfilling."

The 2013 Esri UC was held from July 8-12 at the San Diego Convention Center in San Diego, California, and had 14,000 attendees. In addition to user presentations, the 2013 Esri UC featured hundreds of technical sessions and demonstrations from geospatial thought leaders and experts, as well as the 440,000-square-foot GIS Solutions EXPO and Esri Showcase

For more information, visit www.esri.com/uc.

Esri India Launches Cloud based GIS Platform @ NASSCOM

Esri India (NIIT-GIS India), the country's leading GIS Software & Solutions provider, a joint venture between NIIT Technologies Limited, the global IT services provider and Esri Inc., USA the global leader in geographic information systems (GIS), announced the launch of ArcGIS Online (AGOL), a cloud based GIS platform on 14th February

2013 at NASSCOM Leadership Forum at Mumbai. Press conference was also addressed during the Launch attended by Mr. Arvind Thakur, CEO NIIT Technologies, Mr. Rajesh Mathur, Vice Chairman, NIIT GIS Ltd. and Mr. Dean Angelides, International Operations, Esri Inc. USA. "GIS technology is moving from traditional use as a specialized problem solving tool to the core of enterprise applications" said Arvind Thakur, Chairman, NIIT-GIS Ltd. "ArcGIS Online is a new cloud based mapping system which transforms the way geographical information is managed and used", he added. AGOL is a ground breaking platform which provides intuitive tools to create and publish maps and applications on demand for visualizing and sharing geospatial information. AGOL provides open GIS capabilities to any user allowing access to any application, anywhere, anytime on any device. It facilitates sharing and use of geospatial content within groups of an organization, as well as between organizations and the public, providing a pervasive platform for services. This innovative platform will find use in many government programs such as public safety, health, utility, infrastructure and business applications like site suitability and location analytics. Individuals can benefit from improved citizen services. Speaking on the occasion, Mr. Dean Angelides, Corporate Director, International Operations at Esri Inc. said, "We are very excited with the launch of AGOL in India. As a global leader, we always strive hard to provide greater value to our users by enabling them to solve real world problems more effectively. Early adopters of ArcGIS Online have realized immediate benefits from extending their geographic information to reach more people within their organization and beyond".

Globally, AGOL has been used in solving many significant challenges such as organizing and providing open access to global environmental information, more effective and coordinated responses to large-scale natural disasters, and enabling more efficient operations for global business enterprises •

Esri India Supports the Launch of FICCI-Geospatial Today Publication "Empowering India through Geospatial Technologies - Select Stories"

FICCI and Geospatial Today released the first edition of 'Empowering India through Geospatial Technologies: Select Stories' in January 2013, supported by Esri India. The publication was released by Dr. T. Ramasami, Secretary, Department of Science & Technology and Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences.

With the larger vision of mainstreaming and widespread adoption of geospatial technology for planning and development, the publication aims to serve as an information bank for potential end-users to gain from the experiences of successful applications by other individuals and organizations. Geospatial technologies enable generation of cost effective, timely and reliable information in spatial as well as temporal domain. This information can be utilised for regional to micro level management of resources and developmental planning. Owing to their multifarious capabilities, geospatial technologies stand proven as an effective administrative and management tool for decision making in diverse sectors.

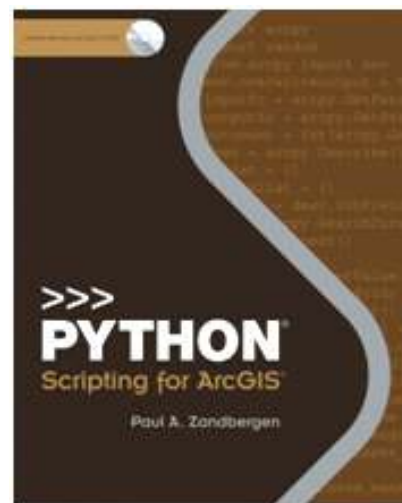
The book is a compilation of articles and case studies of successful applications of geospatial technologies for decision-making and governance across sectors in India. It captures more than 40 success stories depicting the utility of geospatial technologies for achieving varied deliverables in different sectors. An attempt has been made to provide a holistic understanding of various applications across sectors such as: governance, municipality, infrastructure, natural resources & agriculture, disaster management, security, FMCG and banking.

Speaking on the occasion Mr. Rajesh Mathur, Co-Chair, FICCI Task Force on Geospatial Technologies and Vice Chairman, NIIT-GIS Ltd., mentioned that his Task Force has taken up the charge of promoting the use of geospatial technologies across different domains and at the same time will propagate the role of GIS •

Esri Press Publishes Python Scripting for ArcGIS

Python Scripting for ArcGIS is a technical guide that provides a clear, step-by-step process for the creation of Python scripts to enhance ArcGIS 10.1 capabilities.

"Python scripting is a fundamental tool for GIS professionals to extend the functionality of ArcGIS and automate workflows," says author Paul A. Zandbergen.



"You can use it to modify the existing capabilities of ArcGIS and create new ones."

Python Scripting for ArcGIS is a guide for experienced users of ArcGIS and students that are interested in learning how to create Python

scripts. No previous programming experience is necessary. Each chapter in the book has a corresponding exercise on the accompanying DVD, and a free 180-day trial of ArcGIS 10.1 for Desktop is included.

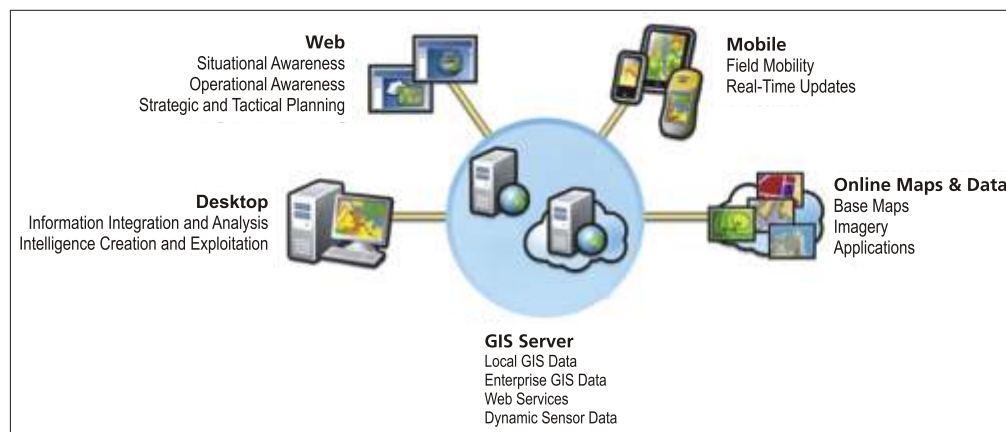
Python is the scripting language of choice for ArcGIS users because of these characteristics:

- Simple and easy to learn
- Free and open source
- Cross-platform compatible
- Interpreted, not compiled
- Object oriented

Zandbergen is an associate professor of geography at the University of New Mexico in Albuquerque where he teaches classes in GIS and spatial analysis. His areas of expertise include GIS applications in criminology, economics, health, and ecology, as well as spatial and statistical analysis techniques using GIS

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ArcGIS as a System for Law Enforcement



collaborative approach is designed for operations personnel and does not require GIS expertise.

Mobile

The increasingly diverse mission of law enforcement requires a mobile GIS capability. Officers need the ability to access to the common operating picture (COP) in the field, to provide

ArcGIS provides a system for Law Enforcement that supports all facets of their increasingly diverse mission. The data management, analytical and visualization capabilities of the ArcGIS system supports the operational needs of Law Enforcement from the command center to planning to the field.

Desktop

ArcGIS for Desktop technology provides crime, intelligence and operational analysts in thousands of law enforcement agencies worldwide the spatial analytics, modeling and visualization capabilities they need to meet the mission of their agencies. These tools provide agencies a place-based understanding of crime and other events in their communities through the analysis visualization as well as providing modeling and forecasting capabilities. ArcGIS is a decision support tool that enhances an agency's ability to intelligently deploy and use scarce resources. This level of GIS analysis is typically performed by a GIS technician.

Web

Modern law enforcement agencies need visibility into the operations of their agencies as events occur and a web-based, GIS-enabled, common operating picture (COP) provides this capability. Basemap data (streets, imagery) can be fused with operational data (crime, accidents, road closures & other events) as well as analytics (crime hotspots, habitual offenders, demographics) and other data (cameras, sensors) on the GIS platform to provide a comprehensive, dynamic view into the activities of an agency. This cost-effective and

updates from the field in tactical or emergency operations, and the ability to collect GIS and non-GIS data for transmission to the COP for visualization within a geographic context. A mobile GIS provides law enforcement with critical information about their proximity, crime, criminals and other information whether they're using a mobile phone, tablet or laptop. ArcGIS for Windows Mobile is configurable for use in the field with minimal training required.

Online Maps and Data

ArcGIS Online and ArcGIS.com provide access to all types of GIS data, imagery, and applications and is a key component of the ArcGIS system for law enforcement. A variety of worldwide base maps are available including imagery, streets, topography, community base maps and more. Emergency personnel can create private or public groups to exchange map data, projects, and presentations.

GIS Server

ArcGIS for Server is the core component of the GIS system for Law Enforcement. It can be deployed within the law enforcement facility or can be hosted in the cloud and provided as a GIS service. ArcGIS for Server provides the platform for the organization and management of GIS data available to the desktop for planning and analysis for enhanced decision support and analysis of unfolding events. It manages mobile connections to consume updates and edits which are stored in the database and published to the COP. It also enables access to dynamic data, services, and other online GIS data that is made available to all other GIS clients and viewers within the system •

What's new for geocoding in ArcGIS

Locator packages

Locator packages (.gcpk) make it easy to share locators with others. A locator package may contain one locator or a composite locator along with its participating locators packaged into one convenient, portable file. The file size of the locator package is smaller than the locator as it is compressed and thus makes file transfer easier. Locator packages can be used for easy sharing of locators between colleagues in a work group, across departments in an organization, or with any other ArcGIS users via ArcGIS Online. Locator packages can also be used to create an archive of the locators.

Locator packages can be created by right-clicking a locator or composite locator in the Catalog window and choosing Share As > Locator Package. Then you can create the package using the Locator Package dialog box.

Publishing geocode services

ArcGIS 10.1 introduces a unified publishing experience for publishing GIS resources such as maps, tools, and locators to an ArcGIS Server.

The publishing of services to an on-premises or cloud-based ArcGIS Server can be invoked directly from the main menu in



ArcGIS for Desktop or by right-clicking a locator or composite locator in the Catalog window and choosing Share As > Geocode Service.



Address Locator Properties dialog box

ArcGIS 10.1 introduces the Address Locator Properties dialog box, which allows you to modify the settings of a locator and easily fine-tune the locator. The properties are listed in groups.

To view or modify a locator's settings, right-click the address

locator you want to modify in the Catalog window and click Properties to open the Address Locator Properties dialog box.

New locator properties

Several new properties have been added to locator styles that allow you to do the following:

- For street or point address locator styles, geocode addresses without house numbers or zones.
- Add more information to a locator, such as display extent, specific street ID, and rank of feature.
- Control geocoding performance.

Searching for locations in current map extent

In ArcMap, a new option, Use Map Extent, is added to the Geocoding toolbar and the Find dialog box. If you want to search for locations that are relevant only to the area on the map, the Use Map Extent option allows you to limit the search for candidates within the current map extent.

Geocoding geoprocessing tools

Two new geocoding tools are in the Geocoding toolbox:

- Consolidate Locator—Consolidates a locator or composite locator by copying all locators in a single Folder
- Package Locator—Packages a locator or composite locator to create a single compressed .gpk file



ArcGIS Explorer Online

ArcGIS Explorer Online is an online application that lets you explore and present maps within an efficient and well-structured environment. Maps show you where things are, they tell you what they are and help you understand why they are that way. ArcGIS Explorer Online lets you open a map, add other content to it, navigate around it, ask questions the map can answer, and present and share the map with others.

What can I do with ArcGIS Explorer Online?

Some of the things you can do with ArcGIS Explorer Online include:

- Search for and open maps, and navigate around within a map
- Create new maps, add and edit different

types of map content

- Find out more information about the things shown in the map
- Locate places, addresses, airports, intersections, and other geographic entities
- Measure the length and area of things on a map
- Visually interpret data in the map using a dashboard
- Create a presentation to show to other people
- Share your map with other people
- Create and manage data and groups on ArcGIS Online

Opening maps in ArcGIS Explorer Online

Maps from ArcGIS Online can be opened in ArcGIS Explorer

Contd on page No.15...

Elevate the value of GIS for your Organization with ArcGIS 10.2

ArcGIS 10.2 is a full release of the ArcGIS platform. The flagship product from Esri, ArcGIS® for Desktop, is a premier GIS tool for authoring data and maps, performing geospatial analysis, and publishing applications for the ArcGIS web services that bring the ArcGIS system to life. ArcGIS® for Desktop 10.2 release includes improvements and new functionalities such as:

Improved Performance

- Support for parallel processing up to 4 cores added to several Spatial Analyst tools
- Support for 64-bit background geoprocessing via an optional downloadable executable

Enhanced Security

- Single Sign On support allowing same credentials to be used across the ArcGIS system
- PKI (Public Key Infrastructure) support. Enterprise, Defense and Intelligence customers are examples of PKI Users

New functionalities in 3D GIS

- Publish ArcScene projects as a 3D Web Scene and share to ArcGIS Online or embed to a custom web page
- 3D Analyst users can:
 - Embed CityEngine's modeling capability directly within existing geoprocessing workflows
 - Share enhanced Visibility tool with Spatial Analyst
 - New Intervisibility tool simplifies identifying sight lines obstruction by any intermediate features

Data Interoperability

- Support for U.S. Census Bureau TIGER/GML, Google Spreadsheet, and 14 other file formats included

New and Enhanced Geoprocessing tools

- More than 40 new analysis / Geoprocessing tools added
- New Optimized Hot Spot Analysis tool for interrogating data and determining optimal settings

- Import and export Microsoft Excel spreadsheets using the new Excel to Table and Table to Excel tools

Data Management

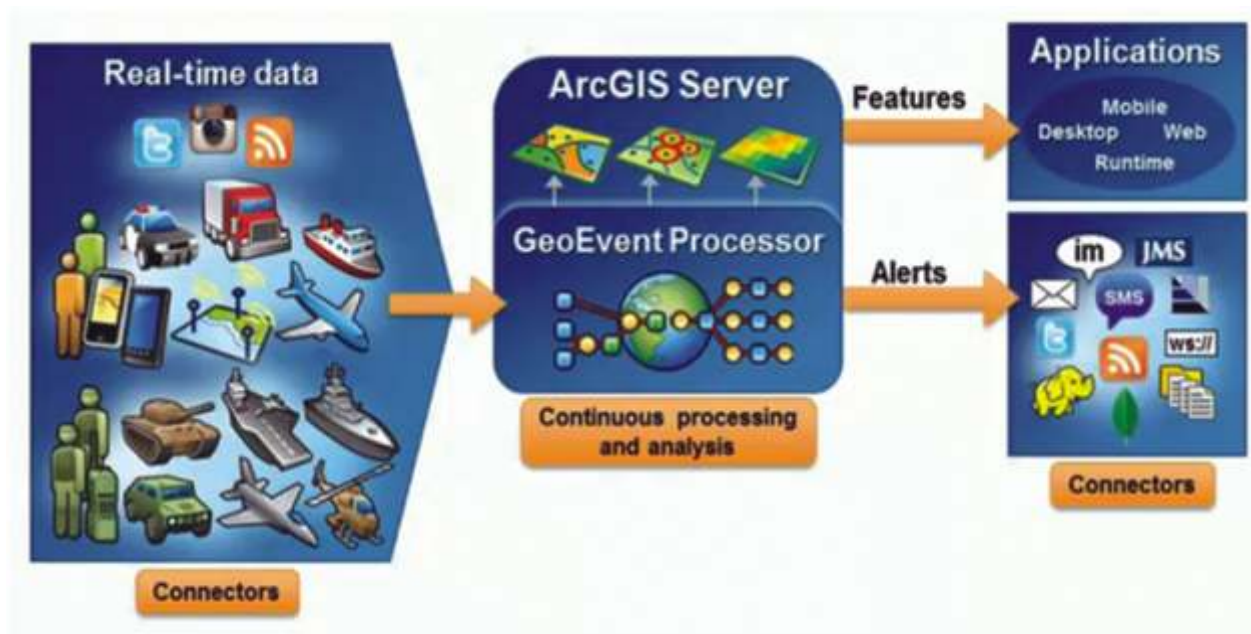
- Enable and disable geodatabase archiving
- Versioning not required for archiving functionality beginning at 10.2
- Query Layers support to connect to and work with simple feature data in Teradata database or SQLite database
- Support creation and use of SQLite workspace using either the native Esri ST_Geometry spatial data type or the SQLite Spatialite spatial type
- Query Layers support added for IBM Netezza 7.0 and INZA 2.5
- Publish data from your DB2, Informix, Oracle, PostgreSQL, or SQL Server databases stored in the native spatial types as a feature service on your ArcGIS Server
- Three new tools in Raster toolset
 - Compute Pan sharpen Weights,
 - Merge Mosaic Dataset Items and
 - Split Mosaic Dataset Items collapse or expand mosaic rows
- Update field properties like Data Type, Field Length, and Allow Null in an empty table or in feature class in the Geodatabase

New Mailing Labels

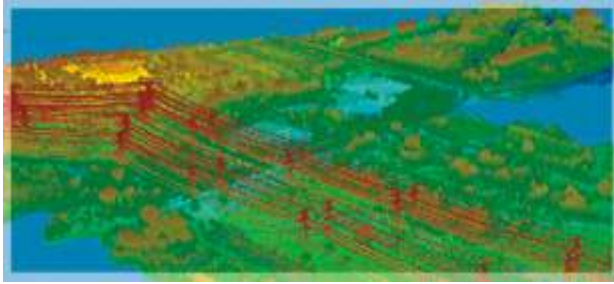
- Create mailing labels
- Preloaded, commonly used, templates available
- Support for users to add own templates

Support for real-time feeds

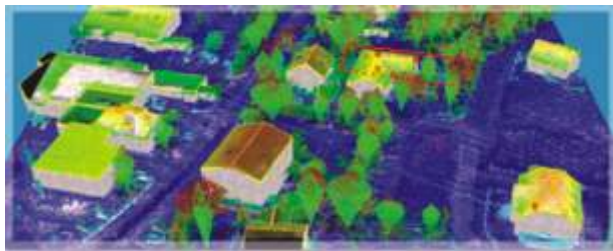
- Support for real-time feeds from GeoEvent Processor* in everyday decision making
- Process vast amounts of real-time data on the fly and display relevant information from these feeds in all ArcGIS clients, including ArcGIS for Desktop
- GeoEvent Processor is a new extension to ArcGIS for Server.



ENVI LiDAR

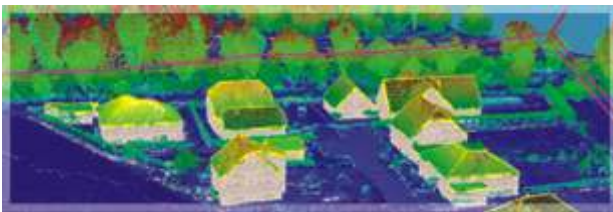


E NVI LiDAR is an interactive geospatial software environment that lets you create realistic 3D visualizations and easily extract important features and products from raw LiDAR point cloud data. The elevation information contained within LiDAR can be used to create Digital Elevation Models (DEMs), or be included in your geospatial products like line-of-sight or right-of way analyses. ENVI LiDAR can also be customized with the API to meet the unique needs of your organization.



Extract Information

ENVI LiDAR allows you to quickly and easily identify and extract 3D features, refine your results, and export 3D products that can be fused with traditional 2D imagery for further analysis or inclusion in your GIS.



Automated Feature Extraction

ENVI LiDAR allows you to find features of interest utilizing LiDAR data through automated feature identification with manual tools for quality control. Feature identification can be performed on an entire point cloud scene or a user defined subset of a scene – providing you with accurate information in a fraction of the time. Features you can extract include:

- Trees (X,Y,Z,H,R)
- Power line vectors
- Power poles (X,Y,Z,H,R)
- Power line attachments (X,Y,Z)
- Power line vectors
- Digital Surface Model (Grid, TIN)
- Digital Elevation Models

- Classified Point Cloud
- Ground contours
- Building roof face vectors
- Building Perimeter vectors
- Point density and coverage analysis



Refine 3D Features

ENVI LiDAR includes interactive tools to refine your processing parameters and ensure your resulting feature representations are accurate. In Quality Assurance mode, ENVI LiDAR allows you to interactively fine tune point classifications, manipulate elevation values, and modify feature vectors such as building dimensions, tree shapes, and the location of powerpoles and power lines. A 3D Viewer creates a realistic representation of your processed data, and allows you to further qualify the accuracy of your results as you fly through a scene.



File Support

When analyzing 3D data, limited file support and data ingest constraints often cause you to spend more time than necessary preparing your data for analysis. With ENVI LiDAR the most commonly used file formats such as LAS, ASCII, NITF LAS, and binary are supported, so you can rapidly access and ingest your LiDAR data. Additionally, ENVI LiDAR can simultaneously ingest multiple data files, giving you more time to identify features and analyze results.

More Accurate Elevation & 3-D data for You Geospatial Analysis

Today's professionals are increasingly utilizing three-dimensional sources of information such as LiDAR (Light Detection and Ranging) to get the information they need to make decisions. ENVI LiDAR is an interactive geospatial software environment that allows you to create powerful, realistic 3D visualizations, and easily extract important features and products from LiDAR point cloud data.

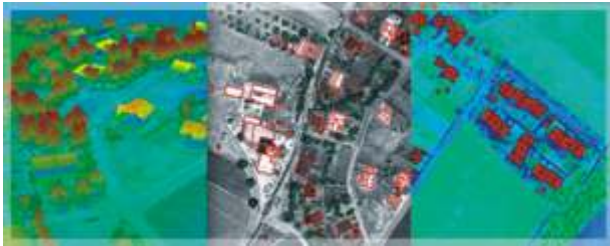
Include the Third Dimension in Your Geospatial Analysis:

- Automatically extract 3D features, edit results, and export products
- Perform line of sight analysis to understand terrain
- Determine vegetation encroachment on power lines and power poles
- Extract building footprints for land use assessments
- Measure objects or distances in 3-dimensional space
- Create seamless orthomosaic products from multiple

- LiDAR collects
- Create maps of canopy fuels for input into a fire behavior model
- Map flood plains for use in emergency management plans

Make more powerful geospatial products using ENVI LiDAR.

INTEROPERABILITY



Professionals are increasingly using three-dimensional sources of information, like LiDAR data, to create elevation products that enhance the information derived from two-dimensional data sources. To do this you need a software tool



that provides accurate results and works with the tools you already use. ENVI LiDAR is interoperable with ENVI image analysis software and ArcGIS® from Esri, and can also be customized through the API to meet your unique needs.

Extensibility

Like all products in the ENVI Platform, ENVI LiDAR has an API that allows you to customize the application to meet the unique needs of your organization. With the ENVI LiDAR API,



you can add your own algorithms, create batch processes, add custom tools, and more. This unique ability means that your software functionality can extend to meet the demands of today and the future.

Integration with ArcGIS

The flexibility of ENVI LiDAR allows you to use results in a variety of geospatial tools like ENVI image analysis software or ArcGIS® from Esri. To perform additional analysis on your exported 3D products, ENVI LiDAR provides an easy to use direct link to automatically open your ENVI LiDAR results within ENVI or ArcGIS. Once your ENVI LiDAR results are in ENVI or ArcGIS, you can now enhance your geospatial analysis using the workflows you already use within these products. When elevation and feature extraction results from ENVI LiDAR are used in conjunction with other geospatial software tools, you can add more information to your geospatial products than ever before. ●

ENVI Services Engine

ENVI Services Engine is our cloud-based image analysis solution lets your organization create, publish, and deploy advanced ENVI image and data analytics to virtually any existing enterprise infrastructure. Now users can take full advantage of the information imagery provides from their desktop, mobile devices, or web applications. ENVI Services Engine maximizes the return on your investment with increased efficiencies, improved decision-making processes, and simplified hardware maintenance.

On-Demand Image Analysis

With ENVI Services Engine, your entire organization has online, on-demand access to the geospatial data and information needed to efficiently make strategic decisions - regardless of location. All employees, regardless of their

geographic location, have access to the same vetted analysis tools enabling reliable, repeatable processes across your organization.

Desktop



ENVI desktop users across your organization can reuse existing ENVI image analysis or create new analytics and publish them to the entire enterprise. This can increase collaboration among disconnected users in different locations. The move towards enterprise-wide image analysis nization use different software packages, resulting in inconsistent workflows, erroneous results, and even incompatible outputs. Our Professional Services Group can help customize your ENVI analytics.



software eliminates the problem where users from different parts of the same organization use different software packages, resulting in inconsistent workflows, erroneous results, and even incompatible outputs. Our Professional Services Group can help customize your ENVI analytics.

Mobile

An enormous benefit of deploying image analytics in the cloud is the ability to run complex, resource-intensive analytics on extremely large datasets from thin clients in web browsers or on mobile devices. By moving the analysis to the data, the need for high powered, local clients is eliminated in favor of lightweight client applications that make HTTP requests via the web to geoprocessing services on the server. Our Professional Services Group is available to assist with custom client development.

Simple Workflow

A cloud or enterprise deployment of ENVI Services Engine lets multiple users in remote locations run advanced image analytics on large datasets. Centralized geoprocessing applications can easily be tailored for data discovery, and fusion of data and products. This ability to create custom, simplified workflows means that your non-traditional, remote users can perform complex, proven analysis techniques and achieve expert-level results.

Centralized Deployment



The desktop software model that has defined the IT infrastructure of the last two decades has created a breakdown in data sharing, software management, and overall communication within businesses and organizations. The enterprise-wide server environment provided by ENVI Services Engine allows for centralized management of users, software, and data.

Interoperability



Many government and large organizations rely on standards to ensure interoperability of software and hardware. This can be of critical importance when implementing a solution from multiple vendors and open source providers. You need client-server technologies with support and compatibility for standards such as OGC® (Open Geospatial Consortium) and the Esri GeoServices REST specification.

Cost Saving



Implementing cloud-based image analytics has a number of benefits for a business. A centralized server architecture that contains all of the data, analytical, and software needs of an organization is lower cost and easier to manage. It allows for all of the user administration to occur in a single place. A centralized system is also easier to update, and allows the administrator to perform faster, more frequent updates to the system as opposed to the time consuming process of pushing updates to a network of desktops. New workflows can also be pushed out much faster. Configuration management is easier with a vetted process and analytics that are maintained in a centralized location, enabling consistent and repeatable processes across your organization. All of these result in monetary savings for the company and improved efficiencies. Reduced hardware and software costs, combined with reduced overhead for support and maintenance are all benefits of deploying enterprise-level software.

Performance



ENVI Services Engine takes advantage of the multiple processors and multiple server class computers of an enterprise or cloud architecture. The web services design can dramatically reduce processing time by allowing the ENVI analytics to scale to the available computational resources.

Implementation

The ability for large-scale organizations to install hundreds, if not thousands, of individually licensed machines is cost-prohibitive. A cloud-based solution is easier to implement and update. And our Professional Services Group can assist with your custom implementation of ENVI Services Engine.



Our Professional Services Group can assist with your custom implementation of ENVI Services Engine.

GIS for Proactive, Intelligence-Led and Informed Policing

Today law enforcement agencies are faced with numerous challenges to protect life and property and provide community safety. They must contend with ever-increasing demands including growing communities, tighter budgets, and finite resources. The rapidly changing social, economic, and political environments, both domestically and internationally, further complicate these problems. Advancements in technology is driving a significant change in how law enforcement agencies are driving their mission of protecting citizens, ensuring officer safety, and serving the community.

Applying Geographic Information System (GIS) to crime mapping and analysis is a major innovation of law enforcement agencies around the world. The law enforcement agencies are realizing the power of maps by using robust GIS applications to meet strategic, tactical, and administrative goals.

GIS technology provides law enforcement agencies with a complete platform for managing their operations. It provides an information-based method supporting all roles and aspects of law enforcement. GIS enables all agency personnel to work with the same common operating picture, viewing easily understood maps through a cost-effective use of finite resources. Databases, in-vehicle computers, mobile devices, and GPS tracking equipment enable cost-effective data input and output systems and empower data analysis and dissemination to all who need it—officers, investigators, crime analysts, street supervisors, and upper-level managers thereby building a common operating picture.

GIS supports the law enforcement mission by providing the foundation to address four key dimensions:

1. Operational Awareness
2. Information Integration and Analysis
3. Strategic and Tactical Planning
4. Field Mobility

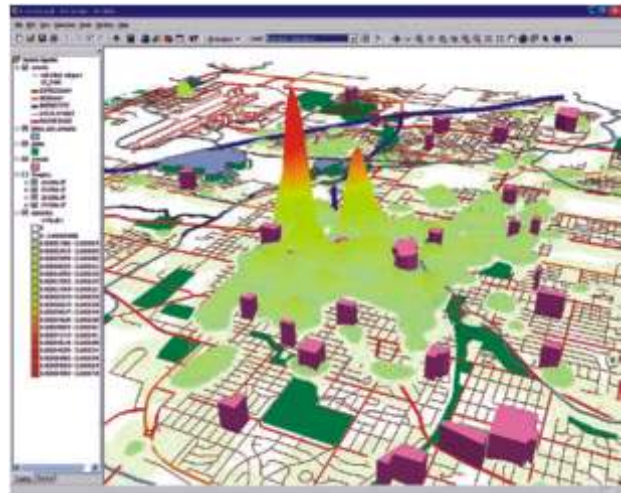
Operational Awareness

Supporting a comprehensive, relevant view into various activities.

GIS can capture location information accurately no matter the data type or source. All types of data can be accessed and viewed by a common reference point—geography. Through GIS, managers can access data-rich maps that provide a snapshot of where crime is taking place and what agency resources are deployed to combat crime; the system can also support resource management and decision making in real time.

This map-based operational awareness is supplied through an executive dashboard. GIS-focused dashboards help agency managers clarify, prioritize, and manage assets and personnel needed to address criminal activity as well as man-made or natural disasters. Through this dashboard, actionable intelligence can drive day-to-day operations, planning, and investigations from multiple data feeds. The result is a common, relevant operating picture (CROP) whether to provide security for a large event, plan a comprehensive campaign to reduce drug-related crimes in a neighborhood, or disseminate detailed statistics and maps on quality-of-life issues to residents of a given neighborhood. A GIS meets the

demands for providing accurate, mission-critical, real-time awareness for officers, commanders, and chief executives.



The Lincoln, Nebraska, Police Department uses ArcGIS to perform 3D density analysis of narcotics-related crimes

Information Integration and Analysis

Managing data effectively and reducing information overload

Crime and intelligence analysts provide vital intelligence to help apprehend criminals. They enable law enforcement and other criminal justice agencies to benefit from high-tech tools that can transform esoteric, raw data into useful information. The ever-growing sophistication of computer analysis does present, however, a growing problem: as more data are captured and maintained, making sense of it all is increasingly difficult. GIS technology addresses the “data rich but intelligence poor” problem, providing a medium to enhance analyses and assessments. GIS solutions map chronological patterns or trends over time (such as auto thefts over the last six months); physical and geographic patterns for specific crimes (such as crimes in relation to weather, building locations, or high-volume traffic areas) and social networks (for example, a series of potentially related issues such as burglaries, the sale of narcotics, and probationary housing).



Twenty-four-hour crime density for a three-month period; total number of crimes = 375. By the South Georgia Regional Development Center

Strategic and Tactical Planning

Creating more opportunities for proactive policing through analytic tools

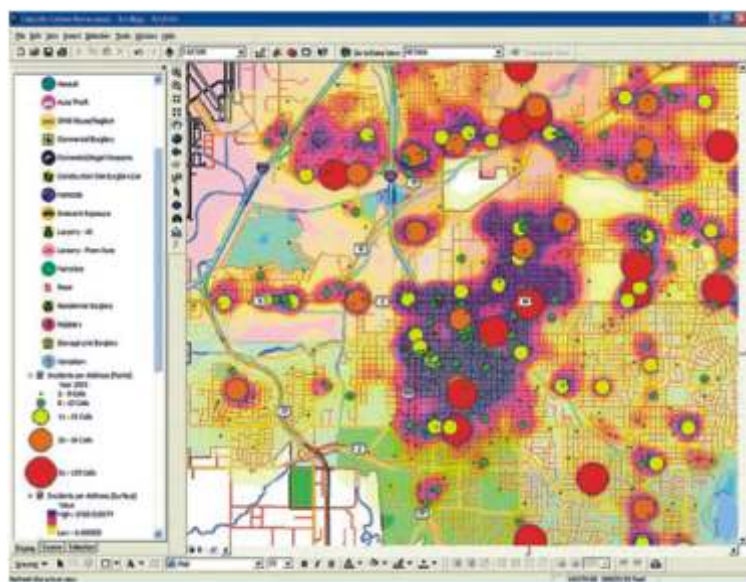
Proactive policing—identifying and addressing criminal activity trends instead of merely reacting to them—is of paramount importance and involves strategic and tactical planning. Police need to identify vulnerabilities, risks, and threats accurately; this involves understanding variables both within the organization as well as on the street. A GIS provides a framework to make and execute critical decisions efficiently and effectively. Data is not simply viewed in a GIS, but acted upon. Strategic and tactical planning is a multidimensional process that involves intelligence gathering, risk assessment/analysis, response scenario modeling, procedure documentation, and traditional training and exercise.

Strategic and tactical planning begins with gathering and collecting data. Data can identify the variables of who, what, when, and where in any potential incident. Data can come from many sources, including local records management system (RMS) repositories, state databases, and data collection projects seeking specialized information.

GIS for Strategic Crime Mapping

GIS can help in efficiently and effectively matching demands for service with service delivery. By knowing where problems are, it also provides a visual means to proactively combat crime and communicate with citizens to build support. GIS helps to:

- Understand events and dynamics in a neighborhood including persons, events, and crime hazards
- Identify risk factors including businesses, buildings, or other locations that draw crime
- Rapidly reconfigure beats and reallocate resources after analyzing crime trends over time



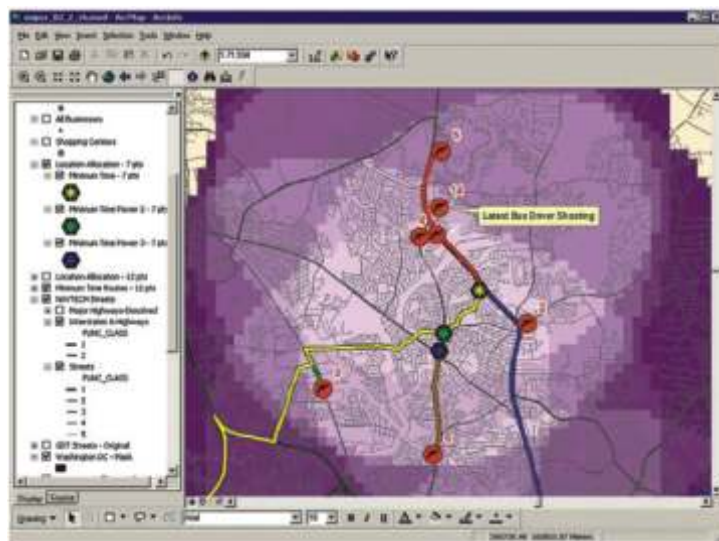
Crime density and hot spots analyzed by the Lincoln Police Department, Lincoln, Nebraska

- Develop plans for special crime abatement teams to address regional or seasonal hot spot locations
- Capture repeat call-for-service locations to apply additional help and resources

GIS for Tactical Crime Mapping

GIS supports your needs in tactical crime mapping by providing a platform for:

- Analyzing crime data to identify crime patterns and series
- Linking modus operandi and suspect information to specific crime locations
- Providing investigative leads by aggregating data from multiple sources



Geographic analysis of serial crime events in a major metropolitan area

- Forecasting potential crime locations through spatial tools and techniques
- Supporting operations plans and clarifying ideal deployment locations
- Clearing cases by linking suspects to specific crimes after arrest
- Continuous active monitoring of high-risk and convicted Sex offenders

Field Mobility

Providing a platform for data and information exchange into and out of the field GIS provides an incident command with actionable knowledge: the locations of deployed resources, where conditions are worsening, and a picture of potential hazards. It supplies real-time situational awareness through field applications that collect data. Information can then be electronically “pushed” to tactical teams using mobile solutions so that incoming units know where to stage, where to deploy, and where to go for additional equipment and supplies. In-vehicle computer terminals, mobile devices, and wireless laptops enable viewing digital real-time situation maps. Operations personnel can provide updates back to the command center. As new information arrives, the GIS database is updated, and the new CROP is immediately viewable in the field through mobile devices.

GIS turns Data into Actionable Intelligence

GIS is foundational—it is based on open technologies and industry standards, meaning that it integrates fully with existing IT systems. This means that law enforcement agencies can get the most out of data they are already housing. GIS also brings together data from multiple sources. GIS applications across various dimensions include:

Crime and Investigative Analysis

- Leverage and fuse spatial data to a wide variety of traditional law enforcement data sources
- Provide contextual information for a more informed response
- Identify and link related or seemingly unrelated crime patterns and trends

CompStat and Accountability Methods

- Implement plans to reduce crime and improve quality of life
- Support collaboration through informed problem solving for all levels of law enforcement
- Ensure coordination and eliminate duplicative efforts

Community Policing

- Integrate demographic, housing, business, and other data for understanding neighborhoods
- Site community policing outreach offices in proximity to populations at risk
- Perform a multitude of tasks and analyses using historical socioeconomic data

Emergency/Communications

- Quickly locate and map emergency call locations
- Display the current locations of public safety vehicles for efficient dispatch
- Display public safety resource locations for incident management and command and control

Financial and Electronic Crimes

- Monitor and highlight clusters of suspicious transactions

involving potential credit card fraud and food stamp fraud

- Model flows of financial activity between individuals to spot potential criminal dealings or terrorist activity
- Develop intelligent tools to spot sudden changes in a suspect's financial picture

Criminal Intelligence and Analysis

- Analyze crime patterns and provide geographic profiling
- Map crime and law enforcement timelines and activity flows
- Perform strategic analysis by mapping threat assessment and flagging areas of concern

Public Information

- Share information with the general public about emerging problems or threats.
- Enlist the support and feedback of community watch and citizen advisory councils.
- Advise the public of convicted sex offenders residing in their communities.

Corrections, Probation, and Parole

- Map crime patterns and trends among the inmate population.
- Visualize networks and associations among inmates that foster crime problems.
- Identify resource gaps and support effective reallocation Processes ●

References:

GIS Tutorial for Crime Analysis <http://www.policchiefmagazine.org/>

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Online, even if they were created using different applications (for example, the ArcGIS.com map viewer). To open a specific map, first find the details page of the map using the ArcGIS Online website, click the arrow next to the Open button to show a list of choices, and choose Open in ArcGIS Explorer Online.

You can also open Explorer Online directly from www.arcgis.com/explorer.

Note:

ArcGIS Explorer Online requires the Silverlight 4 platform from Microsoft, and a browser which supports the Silverlight plug-in, for example current versions of Microsoft Internet Explorer or Google Chrome on Microsoft Windows, or Safari on Macintosh OS. You do not have to install any Esri software on your computer, because the application runs within the existing web browser.

Using ArcGIS Explorer Online with other products

If you and others in your organization work with ArcGIS products, you'll find numerous integrative and complementary uses for ArcGIS Explorer Online that will help you disseminate your work on the web.

ArcGIS Online and the ArcGIS.com map viewer

ArcGIS Explorer Online uses ArcGIS Online as a repository to store any maps that you create. You can also search for and view other content on ArcGIS Online that's available to you, to any groups of which you are a member, and to the public. You can search for and integrate map services you find on

ArcGIS Online into your own maps. You can also view presentations that were created in ArcGIS Explorer Online.

The ArcGIS.com map viewer provides a lightweight map viewing application with a reduced set of functionality compared to Explorer Online. The map viewer does not require any browser plug-ins to be installed. You may find this useful if you want to share maps with users who cannot use ArcGIS Explorer Online.

ArcGIS Server

You can browse the services available from an ArcGIS Server machine, and add those services to a map using Explorer Online. You can also search for ArcGIS Server services that are available publicly on the web from within Explorer Online.

ArcGIS Explorer Desktop and ArcGIS Desktop

When you want to do more than what's offered in ArcGIS Explorer Online, but still use a free lightweight map viewer, consider ArcGIS Explorer Desktop. With this desktop client, you can view web maps and download and view layer packages from ArcGIS.com; you can also include KML, GPS logs, shapefiles, and other data sources directly into your map without importing, retaining the reference to the original data source. You can also view maps in 3D.

ArcGIS Desktop is a professional GIS system that extends beyond the capabilities of the free applications. In addition to creating maps, ArcGIS Desktop is intended for editing and managing geographic databases, performing full-powered analysis, creating geographic models, and working with a wide range of data types ●

Geo-enabling Law Enforcement: A new approach to Crime Prevention, Control, Tracking & Reduction

In today's society, with growing population and limited resources, more and more pressure is built on our Law Enforcement agencies, how to ensure and build a safe society. We need smarter planning, smarter investigations and smarter responses. The traditional and age-old prevailing system of intelligence and criminal record maintenance has failed to live up to the requirements of the existing crime scenario. Manual processes neither provide accurate, reliable and comprehensive data round the clock nor does it help in trend prediction and decision support. Hence, a need is felt for the effective use of Information Technology for crime prevention, control, tracking & reduction.

"The police stations in the country are, today, virtually unconnected islands. Thanks to telephones and wireless, and especially thanks to mobile telephones, there is voice connectivity between the police station and senior police officers, but that is about all. There is no system of data storage, data sharing and accessing data. There is no system under which one police station can talk to another directly. There is no record of crimes or criminals that can be accessed by a Station House Officer, except the manual records relating to that police station. Realising the gross deficiency in connectivity, the Central government is implementing an ambitious scheme called "Crime and Criminal Tracking Network System (CCTNS)". (Sh. P Chidambaram, Ex-Union Home Minister)

Crime and Criminal Tracking Network & Systems (CCTNS) is a plan scheme conceived as a Mission Mode Project under the National e-Governance Plan of Government of India. The aim is to create a comprehensive and integrated system for enhancing the efficiency and effectiveness of policing by adopting principles of e-Governance and creation of a nationwide networking infrastructure for IT-enabled-state-of-the-art tracking system around 'Investigation of crime and detection of criminals'.

Objectives of 'CCTNS'

The objectives of the Scheme can broadly be listed as follows:

- Make the Police functioning citizen friendly and more transparent by automating the functioning of Police Stations
- Improve delivery of citizen-centric services through effective usage of ICT
- Provide the Investigating Officers of the Civil Police with tools, technology and information to facilitate investigation of crime and detection of criminals
- Improve Police functioning in various other areas such as Law and Order, Traffic Management
- Facilitate Interaction and sharing of Information among Police Stations, Districts, State/UT headquarters and other Police Agencies
- Assist senior Police Officers in better management of Police Force
- Keep track of the progress of Cases, including in Courts
- Reduce manual and redundant Records keeping

Under the CCTNS Project, approx. 14,000 Police Stations throughout the country has been proposed to be automated besides 6000 higher offices in police hierarchy e.g. Circles,

Sub-Divisions, Districts, Range, Zones, Police Headquarters and Bureaus including scientific and technical organizations having databases required for providing assistance and information for investigation and other purposes e.g. Finger Print Bureaus, Forensic Labs etc.

Many States has come forward to implement this initiative but effective utilization and integration is still having gaps & challenges.

Every crime problem is related to some location, whether it's an address, street, ZIP Code™, or district.

Key Requirements & Challenges:

- Optimizing Costs
- Ensuring Policies & Mandates
- Resource Optimization
- Officer Safety
- Daily Operations
- Response Times
- Strategic Planning
- Public Expectations

To effectively address these requirements, we must be able to:

- Integrate/Fuse Data
- Develop Actionable Intelligence
- Effectively Allocate Resources
- Create More Time For Proactive Policing
- Get Information Into and Out of the Field
- Provide Timely Operational Awareness

Geographic Information System (GIS) uses geographic approach and provides an interface for integration of large volumes of location-based data & information available from various sources. This plays a critical role in crime mapping & analysis, and helps providing Situational Awareness with a Common Operational Picture.

GIS allows police personnel to plan effectively for emergency response, determine mitigation priorities, analyse historical events, and predict future events. GIS can also be used to get critical information to emergency responders dispatch or while en route to an incident to assist in tactical planning and response. GIS helps identify potential suspects to increase investigators suspect base when no leads are evident. The ability to access and process information quickly while displaying it in a spatial and visual medium allows agencies to allocate resources quickly and more effectively.

In the 'mission-critical' nature of law enforcement, information about the location of a crime, incident, suspect, or victim is often crucial to determine the manner and size of the response. GIS helps co-ordinate vast amounts of location-based data from multiple sources. It enables the user to layer the data and view the data most critical to the particular issue or mission.

GIS can help you leverage the locational aspect of your data to

analyze, understand, and build solutions to the problems you face.

GIS helps crime officers determine potential crime sites by examining complex seemingly unrelated criteria and displaying them all in a graphical, layered, spatial interface or map. It also helps them map populations, fixtures, and equipment to provide further safety. GIS functions, when combined with capabilities of location based devices such as GPS, facilitate tracking of the movements very effectively in real-time / near real-time mode.

Application Areas& Solution Scenarios :

GIS provides an integrated Platform for Data Management, Planning & Analysis.

It provides the ability to integrate information from various sources and serve multiple applications from a single gateway and serve dynamic maps and data quickly on a variety of devices. In addition to providing information for Planning & Analysis, it allows to implement Executive Dashboards for high level efficient monitoring and decision making. In nutshell, GIS plays a critical role in all phases of Law Enforcement as follows:

Planning & Preparedness

- Crime mapping:

Maps offer crime analysts graphic representations of crime-related issues. An understanding of where and why crimes occur can improve attempts to fight crime. Mapping crime can help police protect citizens more effectively. Simple maps that display the locations where crimes or concentrations of crimes have occurred can be used to help direct patrols to places they are most needed. Policy makers in police departments might also use maps to observe trends in criminal activity.

- Display spatial patterns of events:

GIS maps are the quickest means of visualizing the entire crime scenario. The locations of crime events, arrests, etc. can

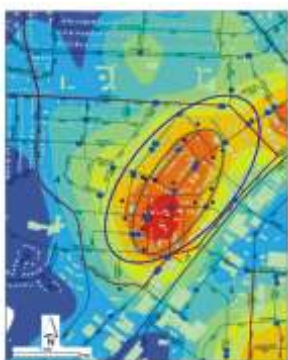


be routinely displayed on maps. This provides an easy method of viewing activities in an area rather than searching through a listing of

events. Maps can also be used to convey more than one type of information at a time. Crime locations can be symbolized according to the day of week, type of crime, modus operandi (a particular suspect's method of operation when committing a crime) or frequency.

- Integrate community characteristics:

Community characteristics (for e.g., Slums, markets, colleges, parks, alcohol permit locations, red light



area, etc.) can be routinely displayed on maps while analyzing crime patterns to interpret relationship between these characteristics and the crime. For example, the locations of aggravated assaults, robberies and alcohol permits can be displayed to see if crime is clustering around locations that sell alcohol. Other mapping data such as bus routes and public housing can also be displayed at the same time to analyse relationships between neighbourhood characteristics and crime.

- Produce thematic maps:

Maps can be produced at any geographic level (e.g. Police stations, divisions, or zones) to aid in the analysis of crime patterns. Each response area can be shaded to represent the number of crimes that occurred in that area during a specific time frame. These thematic maps can also be used to show the change in an area's crime rate. The percent change in the number of crime incidents can be displayed by shading each area according to whether there was an increase, decrease or no change.

Crime Analysis& Decision Support

Crime Analysis is defined as a set of systematic, analytical processes directed at providing timely and pertinent information relative to crime patterns and trend correlations to assist the operational and administrative personnel in planning the deployment of resources for the prevention and suppression of criminal activities, aiding the investigative process, and increasing apprehensions and the clearance of cases. It supports a number of department functions including patrol deployment, special operations, and tactical units, investigations, planning and research, crime prevention, and administrative services.

Crime analysis can be divided into three categories:

Administrative: Focuses on provision of economic, geographic, or social information to administration.

Strategic: Concerned with long-range problems and projections of long-term increases or decreases in crime (crime trends). Strategic analysis also includes the preparation of crime statistical summaries, resource acquisition, and allocation studies.

Tactical: An analytical process that provides information used to assist operations personnel (patrol and investigative officers) in identifying specific and immediate crime trends, patterns, series, sprees and hotspots, providing investigative leads and clearing cases. Analysis includes associating criminal activity by method of the crime, time, date, location, suspect, vehicle, and other types of information.

- Perform radial analysis:

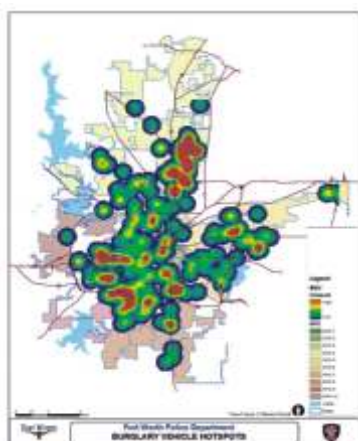
GIS can be used to measure the extent and type of problem within a certain distance around a particular location (e.g.,



street intersection, slum, bar, etc.). The distance can be anything that one wants to use as a radius around a particular location. For instance, we can quickly examine the type and number of offences and arrests that occurred within 500m of a particular location. GIS allows an analyst to quickly eliminate excess information. In addition to focusing on a single location, GIS can also be used to examine events that occurred within a certain distance of multiple locations. For example, an analyst can determine the number and types of offences that have occurred within 500m of all schools. A radial analysis can also be performed to determine which residents might need to be notified when a particular offender has moved into the area.

- Identify clusters of events (hotspots):

GIS identifies areas that contain dense clusters of events (hotspots). These high concentration areas usually demand special police attention. For example, GIS allows an analyst to identify all of the areas in a police station area where at least 5 robberies occurred within a 1km radius. These areas are then outlined on the map. Using GIS to identify hotspots provides a consistent method to measure concentrations of criminal events over time. Hotspots of violent crime, robbery, residential burglary, commercial burglary, auto theft, rape, etc. can be calculated every month for each police station area.



- Compare locations of hotspots across time

Crime hotspots that have been identified over several months can be displayed at the same time. This allows for

the identification of areas with chronic problems and indicates the direction in which a particular crime may be shifting. These types of maps can also be used to solicit resources for an area from other public and/or private agencies.

- Compare hotspots of different crime types

Hotspots of different offence types can be displayed to identify where they overlap. For instance, residential burglary hotspots can be displayed along with robbery hotspots to discover where they overlap. A more detailed analysis of these intersecting areas can then be performed.

- Analyse multiple variables:

The relationship between one variable with another can be analysed and this would indicate the strength and direction of the relationship between the two variables. For instance one could analyse the relationship between the number of alcohol permit locations and the number of fighting. Regression

analysis is used to predict the value of a dependent variable such as violent crime rate based on the values of independent variables such as the poverty level within an area. Regressing allows for additional variables like illiteracy, backwardness, habits, etc. to be included in the model. The results of this type of analysis might be used to solicit resources from other public/private agencies to help reduce the crime rate.

- Crime investigation

Historically, the causes and origins of crime have been the subject of investigation. Some factors known to affect the volume and type of crime occurring from place to place are:

- Population density and degree of urbanization
- Racial heterogeneity
- Variations in composition of the population, particularly youth concentration
- Stability of population with respect to residents' mobility, commuting patterns, and transient factors
- Modes of transportation and highway system
- Economic conditions, including median income, poverty level, and job availability
- Cultural factors and educational, recreational, and religious characteristics. Family conditions with respect to divorce and family cohesiveness
- Climate
- Effective strength of law enforcement agencies
- Administrative and investigative emphases of law enforcement
- Policies of other components of the criminal justice system (e.g. Prosecutorial, judicial, correctional, and probational)
- Citizens' attitudes toward crime
- Crime reporting practices of the citizens
- GIS helps identify potential suspects to increase investigators suspect base when no leads are evident

- Investigate serial offences:

The home addresses, work addresses, and places frequented by victims and suspects of serial offences can be displayed. When details of both suspects and victims are viewed in this manner, intersections between the two can be seen. The spatial patterns of less serious offences that often lead up to more serious crimes can be examined. This is especially important since serial rapists often begin their

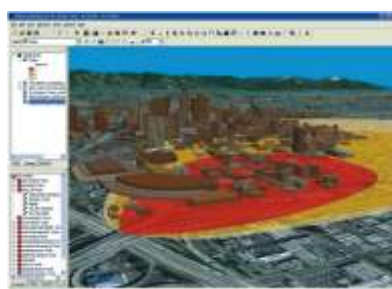
criminal careers committing other offences such as peeping tom incidents, indecent exposures, or residential burglaries.

- Predict behaviour:

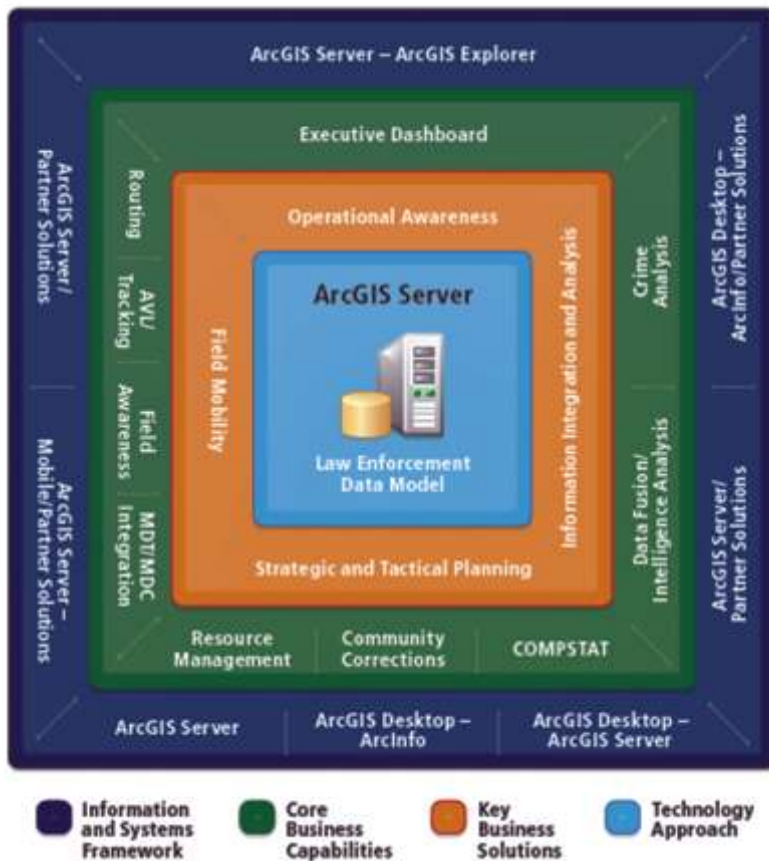
Based on the crime history, models can be developed to predict behaviour of criminals. Using these models, the probable location of an offender's home can be identified. The geographic area where the next crime is most likely to occur can also be predicted.

- Identify suspects:

Crime data consisting of spatial patterns, suspect information and method of operation characteristics can be combined



with arrest locations to provide investigators a tool to identify potential suspects. Investigators can quickly see hotspot locations and the people who have been previously



and using geographic information. It is an integrated collection of GIS software products for building and Deploying a complete GIS wherever it is needed—on Desktops or servers or in custom applications, over the Web, or in the field.

Proposed solution

The CCTNS Portal envisages the integration and timely dissemination of necessary geospatial information in a highly secured way, to all the stakeholders at various levels. Hence, it is proposed to implement a SOA based “Federated Geo-Spatial Portal Framework based Solution” as a reliable and effective platform for implementation of CCTNS solution, which can integrate data from disparate Sources, perform Advanced Location Analytics and disseminate information efficiently to all agencies involved at different levels, in a coordinated manner.

Proposed GIS Solution framework provides flexible and scalable federated architecture for Law Enforcement. The Platform has capabilities to organize, manage and deliver appropriate

arrested for the particular crime around these locations in nutshell, Law enforcement agencies can use GIS solutions to

- Determine optimal locations for deploying resources.
- Analyze the dynamics of an incident in progress to make informed decisions and operational adjustments.
- Identify and examine suspicious activity and threats.
- Enhance officer safety and effectiveness by Providing information and awareness of repeat incidents.
- Target repeat 911 call locations.
- Perform resource analysis and allocation.
- Develop a crime scene log to ensure the integrity of an investigation.
- Exchange information with a neighboring jurisdiction or A jurisdiction half a world away.

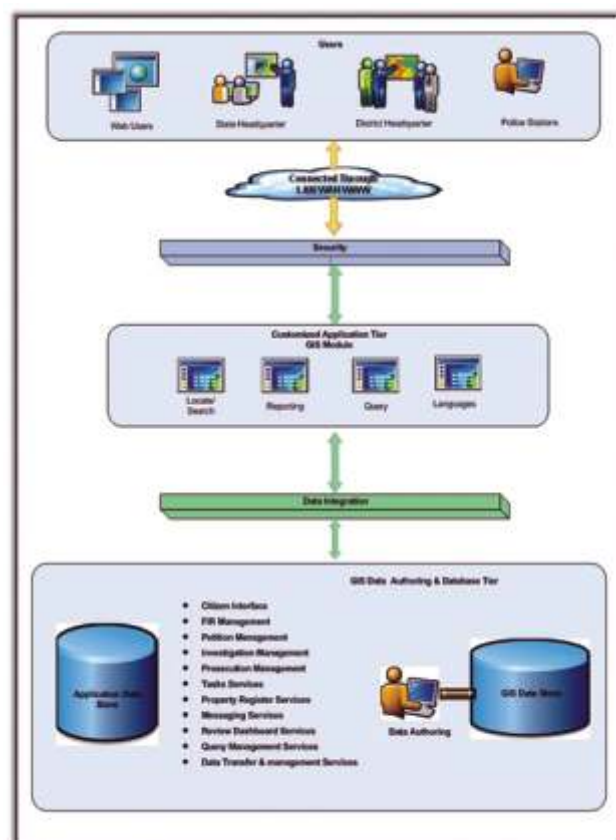
Esri provides tools, technology, and GIS Solutions to deploy true intelligence-led policing. We can use integrated location-based analytics and mapping intelligence to go beyond catching criminals. We can predict where crime will occur and ensure that we have the right resources in the right place at the right time.

With Esri GIS, we can convert data assets into crime-fighting weapons by providing :

- Operational Awareness—Supporting a comprehensive, relevant view into your agency’s activities
 - Information Integration and Analysis—Managing data effectively and reducing information overload
 - Strategic and Tactical Planning—Creating more opportunities for proactive policing through analytic Tools
 - Field Mobility—Providing a platform for data and information exchange into and out of the field
- ArcGIS is a complete system for authoring, serving,

information and data to be accessed by Law Enforcement team based upon their specific missions and roles within the organization.

High level Solution Architecture

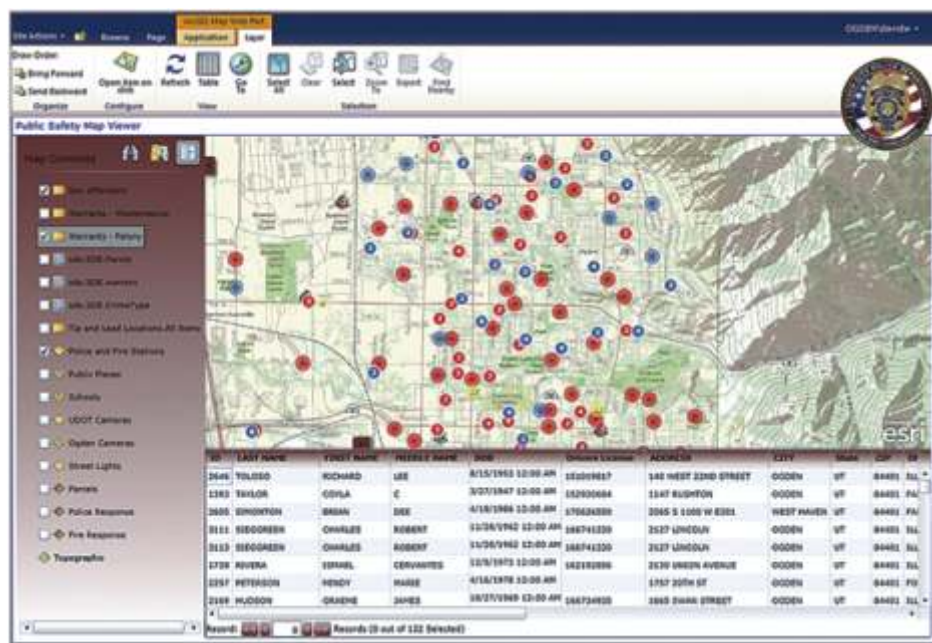


References: <http://www.esri.com/industries/public-safety/law-enforcement> ●

Better Policing Through Analysis

Ogden Police Take Advantage of GIS in Real Time Crime Center. The City of Ogden, Utah, with a population of approximately 85,000 people, is nestled against the Wasatch Mountains with fantastic views of the Great Salt Lake located to the west. Through the years, the city has served as a major railway center and still handles a great deal of traffic today. Ogden is the location of Weber State University.

The Ogden Police Department (OPD) has the responsibility for protecting life and property through the enforcement of federal and state laws, as well as city codes. This entails a wide variety of calls for service, some of an emergency nature and others for information, traffic control, and peacekeeping measures for any public safety-related matter.



Ogden Police Common Operational Picture (COP) provides location information on outstanding felony arrest warrants. This data is used by police to alert responding officers to safety concerns, plan apprehension strategies, and coordinate enforcement efforts.

The majority of the department's efforts and manpower are focused on the suppression, detection, and investigation of crime. Most of this activity comes after discovering or being notified of a possible criminal situation. However, the department also realizes the importance of attempting to eliminate crime and criminal opportunity through the implementation of crime prevention programs.

To better serve its community, OPD recently launched its multimission Real Time Crime Center (RTCC). The center provides 24/7 support to law enforcement and deploys a host of advanced technologies, including camera systems, crime databases, and vehicle tracking. Serving as its foundational integration platform, ArcGIS software provides a multimission common operating picture. The agency's use of GIS comes from nearly a decade's worth of previous work. GIS automatically links crime and other datasets maintained in different databases. OPD can perform advanced analysis and digitally map the results. These functions have allowed police staff to effectively deter crime and make arrests. Bringing those functions into the RTCC has helped extend these benefits to new levels and more people.

"Having GIS available in our Real Time Crime Center allows us to operate more efficiently and work in a more proactive, integrated fashion," says Jon J. Greiner, former chief of

police, Ogden Police Department. "It helps us—each different bureau of the police department—make better decisions about how we should investigate crime. It reveals important new information that leads to better decision making and use of limited resources."

Initial GIS Success

The Ogden Police Department consists of 144 sworn officers serving the community's 85,000 residents. The OPD crime analysis unit first began using the full capabilities of Esri desktop GIS software for its daily work nearly a decade ago. Analysts could compare incident information—such as burglaries, robberies, assaults, auto theft, gang activity, and other crime—with other information, such as the location of

parolees, sex offenders, known criminals, and gang members. This provides an initial data picture that may help in predictive analysis or geographic profiling.

In 2008, OPD saw a significant enhancement: a more powerful web-based analysis tool allowed people to identify patterns through dynamic hot spot mapping, which is simply analysis that shows areas of crime intensity. This opened up crime data to any OPD officer with web access. Just a few mouse clicks allowed officers to quickly view, analyze, and share crime trend maps. The intuitive solution helped officers get the information they needed without requesting it from the crime analysis unit, taking more training, or installing additional software. Officers could do their jobs better without having to

become GIS software experts. The agency also added automated vehicle location (AVL) capabilities to its GIS system.

"It was added so that we could track and analyze patrol patterns and their relationship to crime patterns," says Josh Jones, senior project coordinator—GIS, City of Ogden. "This tool has been helpful in monitoring criminal activity, as well as planning crime fighting activities and monitoring their success."

That same year, Ogden teamed with Esri Partner Pictometry to include detailed oblique aerial photography within its city databases. This data made its way to OPD. The Pictometry-supplied data allows the easy computer viewing of city buildings and other structures from all sides and angles. Analysts can measure distances between windows, fences, streets, and other items of interest without going out to the site, which might risk compromising an operation.

For instance, the Pictometry data has been particularly useful in Special Weapons and Tactics (SWAT) and narcotic strike force actions. Commanders can better develop maneuvers prior to carrying out actual field operations. Instead of speculating on the time it would take to cross a yard; go over a fence; and forcibly enter a one-story, two-bedroom house, officers can get exact distance measurements and view detailed oblique photos that show the area and situation where the officers will deploy.



Ogden Police Department relies on ArcGIS Server, as well as ArcGIS.com, to share information with the public or partnering police agencies. Pictured: Known burglary suspects are shown inside a 1,000-foot buffer of forced-entry residential burglaries.

"While there are some established protocols and procedures for major events handled through ATAC, we try to allow officers and analysts the freedom of independent thinking, enabling better solution-based recommendations," says Greiner.

In addition, RTCC features a deployment of the Microsoft Fusion Core Solution (FCS). OPD will be the first law enforcement department of its size to deploy this platform. FCS was developed as a result of collaboration between Microsoft and Esri. The powerful data management and

"The power of GIS rests in its ability to relate different information, particularly in a spatial context," says Greiner. "This helps trained analysts reach a conclusion about crime and other data relationships that might otherwise be missed. Since most of our city information contains a location reference, placing it on a map is a logical investigative tool."

A New Level of Success: The Real Time Crime Center

OPD reached its next technology milestone by opening the RTCC in July 2011. The RTCC, formally named the Area Tactical Analysis Center (ATAC), uses state-of-the-art tools to integrate many disparate data sources. The center houses multiple records: local warrants, criminal history, jail data, property information, arrest affidavits, and more. These records can be used by analysts, administrators, investigators, and officers in the field.

Previously, the OPD crime analysis unit supplied a monthly statistical report that included Esri software-derived maps. The information was given to the command staff and lieutenants to develop crime reduction plans and respond to issues of concern. The information was manually extracted from the record management system (RMS) and CAD systems and uploaded into GIS software for analysis.

The city uses the RTCC to perform these queries automatically through ArcGIS software. The new workflow reduces the time analysts spend to extract, cleanse, and upload many disparate data sources.

collaboration tool Microsoft SharePoint is also fully integrated with the analysis tools found in ArcGIS software.

FCS provides a way to bring different data silos together in one place. In addition, it provides a National Information Exchange Model-compliant way to access and exchange data. It allows on-the-fly mapping of address and coordinate information linked to SharePoint. It will also aid in the intake, storage, archiving, dissemination, and search of OPD data. The FCS mapping capability will serve as the common operating picture for the RTCC. It will display events as they happen with real-time AVL data, weather data, plume modeling, and social media feeds.

Other data sources that will be integrated into the RTCC will be third-party data mining tools, license plate reading systems, integration with more than 200 city-operated surveillance cameras, tracking and control of an unmanned surveillance blimp, and electronic briefing notes.

"This technology truly allows us to improve our efficiency," says Greiner. "We can make connections and come up with solutions to problems that we might not have been able to do in any other way."

For more information, contact Jon Greiner, former chief of police, Ogden Police Department (e-mail: chiefjg@aol.com), or Wayne Tarwater, chief of police (e-mail: WayneTarwater@ci.ogden.ut.us) •

The Search for Missing Children Aided With GIS

Technology and Data Help Recovery

By Geraldine Kochan, National Center for Missing and Exploited Children

A 2002 national study released by the U.S. Department of Justice's Office of Juvenile Justice and Delinquency Prevention (OJJDP) estimated approximately 204,000 family abductions took place in 1999. Forty-four percent of these involved the concealment of the child. In 76 percent, it was the intent of the abductor to prevent contact with the other parent; in 82 percent, the abductor intended to permanently alter custody. The study also estimated 1,682,900 episodes of runaway/throwaway children took place that year. Fewer cases, but more ruthless and violent, involve those children taken by strangers who are sexually molested and killed and those children who go missing without a trace.

With the enactment of the Missing Children's Assistance Act (MCAA) in 1984, Congress directed the U.S. Department of Justice's OJJDP to establish a private organization to act as a national clearinghouse of information on missing and exploited children. The National Center for Missing & Exploited Children (NCMEC) (www.missingkids.com), a nonprofit organization, was established in April 1984.

Impressive Recovery Rate

Every day, 24 hours a day, NCMEC receives calls for assistance in searching for missing or abducted children from law enforcement and searching parents through its national, toll-free hot line (1-800-THE-LOST) in the United States, Canada, and Mexico. Since NCMEC was established, it has had an

impressive recovery record. Through December 31, 2002, NCMEC has assisted with recoveries of more than 94 percent of the cases involving missing and exploited children and handled nearly 1.7 million telephone calls through the hot line. NCMEC now receives an average of 700 calls per day, of which more than one-third require the MCAA-mandated services.

When a child is reported missing to NCMEC, the child is assigned to one of four main missing case types—endangered runaway (ERU); family abduction (FA); lost, injured, or otherwise missing (LIM); and nonfamily abduction (NFA). Currently, ERUs represent approximately 72 percent of the children reported missing to NCMEC; FAs, 22 percent; LIMs, 4 percent; and NFAs, the remaining 3 percent.

To draw attention to the plight of missing children, a variety of tools disseminate the information about the child and/or abductor. After reports concerning missing children are “intaked” by the NCMEC hot line and its protocol requirements are met, a case manager in the Missing Children’s Division (MCD) is assigned and provides technical assistance to the searching parent(s) and to the law enforcement agency investigating the case.

Local law enforcement agencies, the Federal Bureau of Investigation, other nonprofit organizations, and parents might also receive leads. Staff analysts in the NCMEC Case Analysis and Support Division (CASD) work with the case managers to rank these leads for their investigative value. All leads received are disseminated to law enforcement.

Geography and Missing Kids

In 2000, hoping for support for the program, NCMEC contacted ESRI, which provided software to help find missing children. When a child is reported missing as either ERU or a victim of FA, the custodial parent(s) provides NCMEC with information about possible locations where the child might be. For ERUs this might be the location where friends reside or an area that the child discussed wanting to go. For FAs this might include the abducting parent’s present address, former address, or addresses of the abducting parent’s relatives and friends.

This information is entered into the NCMEC database and automatically geocoded with latitude and longitude. When leads of a sighting of a missing child are telephoned into the NCMEC hotline, the information is added to the case file, and as location information from the lead is input into the NCMEC database, it is automatically geocoded. Peg Flick, chief information officer, wrote a program in Java that runs as a background process on NCMEC’s database server that “wakes up” every 20 minutes and ranks any new leads. If the lead location is within a certain proximity of any of the addresses collected from the searching parent as possible locations, these leads are automatically given a high rank.

Case managers and their assistants use MapObjects software on their desktop computers to query each child’s case for the geographic distribution of the leads. All lead locations are mapped in conjunction with the “missing from location” of the child as well as any location to which the custodial parent believes the child may have gone. These leads are displayed against a variety of layers that include states, counties, roads, ZIP Code boundaries, train and bus stations, and telephone exchange boundaries. Additional layers, such as parks and campgrounds, are planned. The visual display of these leads is searched for patterns, and a cluster of high-ranking leads in a given area could warrant a targeted poster distribution either by fax or mail to elicit additional leads.

NCMEC also uses ArcIMS with a system called LOCATER. The LOCATER program was developed to hasten the recovery of missing and abducted children by providing law enforcement agencies with technology to rapidly disseminate images and

information about missing children. More than 3,300 law enforcement agencies have a LOCATER system. ArcIMS is used on the LOCATER server to enable law enforcement agencies with the system to instantly identify other LOCATER systems. The agency can e-mail a copy of the missing child’s poster to the selected LOCATER sites.

Expanding the Work With GIS

Currently two staff members handle mapping for NCMEC. Flick and Geraldine Kochan, a research analyst in CASD, work together to either write the programs or map geographic information on missing children. A variety of maps is updated on a weekly or as-needed basis and made available on the NCMEC Internet and/or Intranet sites. Some of these maps include NCMEC’s America’s Missing: Broadcast Emergency Response (AMBER) plan, weekly maps of children of NFAs and LIMs missing over an 18-month period, residential location maps of America’s Law Enforcement Retiree Team (ALERT) representatives, and deployment location maps of Team Adam, the on-site response and support system that provides human and technical assistance to local law enforcement consultants. Maps that show the regional divisions of some photo partners that post missing children’s posters, including WalMart and ADVO, Inc., are also displayed.

Geographic mapping can also be used to assist in identifying missing or deceased child victims of serial child abductors and murderers. As serial child abductors/murderers become known, data layers of former residences and places of employment as well as the locations of known child victims can be compared with locations of LIMs and NFAs in the database. Using ESRI Business Partner Geographic Data Technology, Inc. (GDT), route data with ArcView Network Analyst, known routes that the serial abductor/murderer used during travel are also displayed. With this information, NCMEC is now able to buffer around a specific proximity of serial abductor sites and routes and compile a list of children who are missing. Each missing child’s case can be examined individually for correlating dates and circumstances surrounding it and forwarded to the law enforcement agency handling the case.

NCMEC uses data from GDT in conjunction with ESRI’s ArcView Network Analyst extension for two analytical mapping projects that are near completion and involve children missing as part of FA episodes and ERUs. Based on a sample of NCMEC’s recovered children, distances between the child’s missing location and the child’s recovery location have been calculated and correlated with the length of time the child has been missing. This information may soon enable NCMEC staff to understand mobility patterns related to missing children and better assist law enforcement officials in recovering missing children. Because NCMEC also handles international missing children’s cases, plans call for expansion of mapping beyond the national level.

Soon NCMEC plans to use ArcIMS mapping on the Intranet to give staff of the Missing Children’s Division, the Case Analysis and Support Division, and others (approximately 25–30 people in all) the ability to query and map all location information regarding a missing child’s case, make maps, and e-mail them to the law enforcement agency handling the case. NCMEC also would like Congressional staff members to be able to query information about missing children from their state through the ArcIMS interface.

The use of GIS at NCMEC to recover missing children is in the early stages. Challenges exist for working on social issues at national and international levels, but NCMEC foresees significant benefits to be gained and is exploring ways in which the ArcView Spatial Analyst and ArcView 3D Analyst extensions will be useful and will contribute to the search for missing children ●

(Reprinted from the Fall 2003 issue of ArcNews magazine)

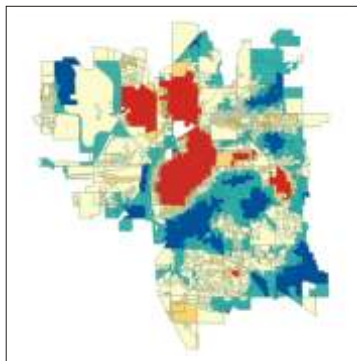
Extend Crime Analysis with ArcGIS Spatial Statistics Tools

By Lauren Scott and Nathan Warmerdam

Editor's note: Crime mapping using traditional GIS analysis techniques has been helping law enforcement agencies track crime incidents and produce density maps showing overall crime patterns. With improvements in the availability and quality of crime data in digital format and more robust GIS software, police departments have expanded the use of GIS. They are using spatial data analysis to assess crime patterns, optimize resource allocation, and improve emergency call response. The spatial statistics tools in ArcGIS enhance spatial data analysis of crime data by supplying tools that use statistical methods designed specifically for use with spatial data. This article describes how the Hot Spot Analysis, Mean Center, Linear Directional Mean, and Standard Deviational Ellipse tools, available at all license levels, can be used for more sophisticated types of crime analysis.

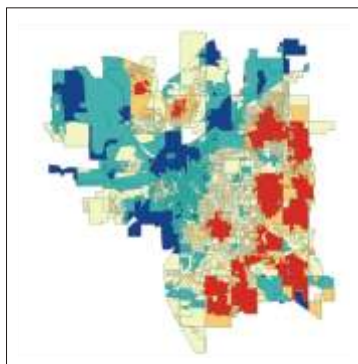
Understanding Where Crime Occurs

Crime hot spots are areas of high crime intensity. Knowing where crime is concentrated helps law enforcement agencies



Crime hot spots generated from vandalism data for Lincoln, Nebraska, that have not been normalized. Hot spots are shown in bright red and located in downtown Lincoln, an area with a large population. Cold spots, or areas of low crime, are shown in dark blue and are located in suburban areas.

Hot spot analysis using vandalism data that was normalized with data from all crime incidents for Lincoln, Nebraska. Again, areas with high incidence of vandalism are shown in bright red and low vandalism areas are shown in dark blue.



make better decisions about allocating police resources. In addition, using GIS to map crime hot spots can effectively communicate crime patterns and crime prevention strategies to decision makers and the public.

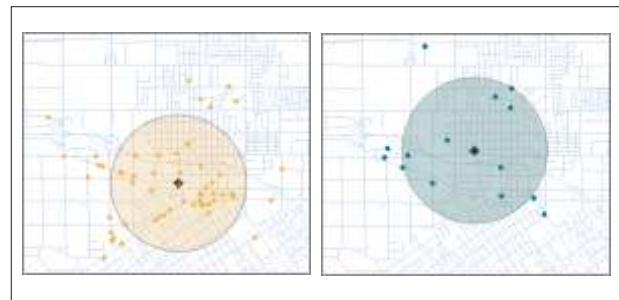
The Hot Spot Analysis tool in ArcGIS identifies spatial clusters of statistically significant high or low attribute values. Given a set of weighted data points, such as the number of crimes per census block, and operating under the expectation that data values are randomly distributed across the study area, this tool delineates clusters of census blocks with higher than expected crime incidents. These clusters are hot spots. The Hot Spot Analysis tool also delineates spatial clusters of lower than expected crime incidents. These clusters reflect crime cold spots and may provide clues about policy or environmental factors that discourage crime.

Running the Hot Spot Analysis tool against raw total crime

counts provides the analyst with an overall picture of crime patterns. A map of these crime patterns effectively communicates where crime activities are highest and where they are lowest. However, the police officers working in the study area day to day will likely already know firsthand where crime activities are highest. Often more useful are analyses that incorporate risk assessment by controlling study area variations in population, overall crime patterns, and environmental factors.

Performing Risk Assessment

One would expect more crimes in areas with more people and fewer crimes in areas with fewer people. Communities are a tapestry of neighborhoods (each one with different characteristics). In essence, a study area can be viewed as a landscape of crime. Gang activities; the types of businesses in an area; and factors that can be difficult to quantify, such as lighting, access to freeways, or a high proportion of residents with criminal records, can drive up the crime rate in some neighborhoods.



For example, if the task is to determine where to implement a vandalism prevention program, simply running the Hot Spot Analysis tool on raw vandalism counts will probably find hot spots just where they would be expected (in downtown areas that have lots of people and, typically, lots of crime). However, dividing vandalism counts in each census tract by all crime counts will represent vandalism counts as a proportion of all crime events. Running the hot spot analysis on these normalized ratios will provide a different picture. It will show the location of clusters of tracts in which vandalism represents a larger than expected proportion of all crime events. Such an analysis, carried out on crime data from Lincoln, Nebraska, showed that vandalism is primarily a suburban issue. Consequently, implementing a vandalism prevention program in the downtown area probably would not be as effective as implementing a program in the suburbs where vandalism constitutes a larger proportion of overall crime events.

Looking for Clues to Criminal Activities

One of the simplest approaches to better understand some factors that encourage criminal activity is examining the distribution of different types of crimes. A crime analyst, for example, might want to know if the mean center for burglaries shifts when evaluating daytime versus nighttime crime incidents. This information could be used to improve the way police departments assign personnel. The Mean Center tool available in ArcGIS 9 computes the average x-coordinate and y-coordinate for each crime incident in the study area.

Another new tool for studying the distribution of crime incidents works with line data. The Linear Directional Mean tool is used to measure the trend of either the direction or orientation of line features by calculating the average angle of the lines. This statistic can be used to evaluate auto theft data that contains information on the location from which each vehicle was taken and where it was eventually recovered. Analyzing this data using the Linear Directional Mean tool highlights recurring patterns that can suggest an underlying infrastructure supporting car thefts in the region. Similar analysis has been used to study data on missing/abducted children.

When crime distributions are compared to other features in the landscape, similarities or relationships often become apparent. The most common way for measuring the trend for points or areas is to calculate the standard distance separately in the x and y directions. These two measures define the axes of an ellipse encompassing the distribution of features. The ellipse is referred to as the standard deviational ellipse since

the method calculates the standard deviation of the x-coordinates and y-coordinates from the mean center to define the axes of the ellipse. This ellipse shows if the distribution of features is elongated, which indicates it has a particular orientation.

For example, crime events grouped by police beat and evaluated using the Standard Deviational Ellipse tool may show that, for some police beats, crime activities are evenly distributed throughout the beat so the ellipse resembles a circle. In other cases, crime activities tend to follow road networks, and crime incidents in these police beats show that orientation.

Conclusion

By placing crime incidents in a geographic context and applying the spatial statistical analysis tools now available in ArcGIS, crime analysts can better understand where and why crime activity is occurring and law enforcement agencies can respond in the most efficient and effective manner •

GIS for Real-Time Crime Centers

Introduction

Law enforcement professionals are continually implementing new technologies that improve how they serve the public. As different types of hardware and software solutions are deployed in a police agency, it becomes increasingly difficult to integrate these tools. An agency can quickly become overwhelmed with large volumes of data.

The implementation and use of all these new technologies and data, including mobile devices, computer-aided dispatch (CAD) systems, records management systems (RMS), automated vehicle location (AVL) systems, license plate readers, and remote camera systems, can become so consuming that we forget the reason we purchased them (i.e., to improve capability, provide public protection, and reduce officer risk).

The recent fiscal climate has led many police agencies to question and reexamine their current technology investments. Harnessing existing capabilities and integrating them into searchable, shareable, and authoritative tools, such as operational dashboards, are the answers. These visual solutions can provide relevant data to the entire organization with customizable tools that allow information to be queried, analyzed, and shared through desktop, web, or mobile platforms.

To accomplish this quickly, Real-Time Crime Centers (RTCCs) were developed. RTCCs are usually placed within a police agency where there is access to dispatch, command, and other key personnel. An RTCC allows enforcers to do the following:

- Access an operational viewer that incorporates various data feeds and displays them on an easy-to-understand map of the jurisdiction
- Collect, store, and manage data about crimes, offenders, suspects, resources, and critical infrastructure
- Perform analysis to understand relationships between crime-related data and risks to help develop actionable intelligence on vulnerabilities and potential consequences
- Develop more effective response and planning

- Get information to and from the field through mobile applications
- Disseminate information to the public or to other law enforcement agencies.

RTCC staff is able to perform the above functions in real time. Using GIS as a scalable platform, they can quickly and easily send and receive information from the field. GIS integrates different systems and data sources, displaying the results on a digital map. GIS is used to collect and store the results, which can be further displayed and analyzed on maps independently or within other applications such as CAD, RMS, crime analysis solutions, or commercial products like Microsoft Office.

- The purpose of this paper is to discuss how GIS can be implemented and used in an RTCC to do the following:
- Understand critical exposures and vulnerabilities
- Identify and prioritize mitigation requirements
- Implement and maintain mission-specific situational awareness before and during first response incidents
- Share data, information, and situational awareness with other organizations and responding agencies, the public, and public safety personnel in the field
- Collect geographically referenced data from all types of mobile devices in near real time

GIS for Real-Time Crime Centers

By implementing GIS in an RTCC, a police agency can leverage a complete platform for managing and improving real-time law enforcement response and public safety.

Geographic information systems were built specifically to collect, analyze, and disseminate information in an understandable way: through a map. Crime can be more accurately monitored, response tactics and investigations improved, and daily law enforcement tasks streamlined. These systems can leverage city, county, state, or federal GIS infrastructures where appropriate and take advantage of hundreds of datasets that before were inaccessible or unusable. The results are better decision making based on validated information in support of agency priorities. The RTCC concept supports multiple far-reaching missions

ranging from immediate reaction to priority calls for service to long-term investigative support for active cases. GIS implementation in an RTCC supports these missions by providing multiple viewers that can access common data.

Map Viewers

Command/Executive Dashboard

The Command Dashboard is a viewer that provides situational awareness for decision makers and command staff using an intuitive graphic interface. This easy-to-manage viewer is always running and provides a high-level overview of a jurisdiction and its current status. It is customizable and can include relevant information such as crime data, offender locations, asset location, automated vehicle location, and critical infrastructure. Additionally, other data that may impact the law enforcement mission, such as major hazard feeds (weather, earthquake, tsunami, hurricane, etc.), can also be connected to CAD (priority calls, vehicle locations, hazmat spills, etc.) and viewed using the dashboard to show high-impact events in the community.

Intended users are command and management staff.

Sample tools

Crime Data Viewer: Shows officer, suspect, and criminal activity reports. Can also include agency assets and critical infrastructure (Incident Management Toolset/Editing Layer [redline incident data])

Active Operational Data Viewer (Special Weapons and Tactics [SWAT] events, search warrants, hostage situations, missing child searches, parades, etc.)

Reporting Dashboard: Number of people and Critical Infrastructure and Key Resources (CI/KR) within an area of impact (warrant service, barricaded subjects, environmental hazard, etc.)

Basic Information Viewers: Important community events (very important person [VIP] protections, gang members/hangouts, active warrants, etc.) to include such items as road repair and utility issues.

Real-Time Crime Center Viewer

The Real-Time Crime Center Viewer is designed for analysts providing live information to field officers responding to priority calls. The viewer focuses on display and management of ongoing situations and responses. It contains the largest range of tools and data as well as the most relevant information about incidents and the local environment. The viewer provides toolboxes for specific functions such as analyzing drive times; finding nearby parolees, probationers, or warrants; tracking police vehicle locations; and displaying active calls for service or historical data from the records management system. It also includes subsets of data that can be switched on or off depending on the type of call and information needed.

Intended users are operations staff that monitors priority real-time calls for service; this may include supervisory staff such as duty lieutenants.

Sample tools

AVL feeds, CAD feeds, and other real-time data displays

- Find Nearby tool
- Tools to calculate drive times and likely left-the-scene routes
- Integration points for live video cameras, license plate

readers, or other local intelligence

- Incident Management Toolset/Editing Layers (redline incident data)
- CI/KR Management Module allows for update and status of CI/KR locations

Task Force/Specialized Units/Agency Divisions Viewer

The Task Force/Specialized Units/Agency Divisions Viewer is focused on the management and needs of specific units. Gang or narcotic units have differing day-to-day needs for data management and examination than patrol officers or a property crimes detective. This viewer includes access to relevant data for specific assignments. Warrant or offender management units may need to know what resources are available to them,

including nearby officer locations and availability, and location and routing analytics to help them be more efficient. Patrol commanders may be interested in AVL data as it compares against calls for service. This viewer also provides data on area transportation networks for optimum routing and movement of police vehicles, as well as the status and location of officers in the field.

Intended users are police command, specialized units, and so forth.

Sample tools

- AVL or License Plate Recognition (LPR) data
- Specific data such as outstanding warrants, process services, and time-sensitive data such as sex offender or parolee checks
- Resource Management Widget (update, task, status, etc.)
- Find Nearest Resource/Routing Widget Combination
- Establish Roadblock/Supply Route Tools (change and monitor supply route attributes)
- Event planning and management tools
- Camera feeds
- GPS locators

Public Information Viewer

The Public Information Viewer provides the local community with data about law enforcement activities. This can include planned events (such as parades, road closures, etc.) or crime statistics (missing children [Amber Alert], police blotter, crime data, etc.). This viewer is configured to be lightweight and is customizable to control the information provided to the public.

Intended users are the general public.

Sample tools

- Crime statistics for a neighborhood
- Am I Affected tool (input address and show whether location is in a planned security zone for a parade, local event, or emergency situation)
- Citizen Engagement: Report tips and leads (graffiti, broken windows, narcotic activity, etc.)

Solution Overview

GIS software provides comprehensive features and functionality for secure data management, analysis and planning, field mobility, situational awareness, and citizen engagement. It enables data to be transformed into actionable intelligence that can then be used for decision making and policy execution. Using GIS modeling and analysis tools makes the most of data to help understand

what it means and take better action.

GIS software and data components, maps, and applications, along with training and support services, must be able to be customized based on specific organizational requirements.

GIS must also easily integrate and connect with other hardware and software providers. This provides easy application and data exchange at a cost savings.

Data

Data is an essential component of a GIS implementation. GIS easily incorporates various data resources to use with GIS software to support application requirements. Many data

resources that can be incorporated into a GIS include the following:

understanding real-time crime response is different than that of fusion centers and high-intensity drug or intelligence centers, the technology foundation and platforms are similar. Building an RTCC on these standards improves information sharing and event coordination.

Implementation of a GIS for RTCCs (Road Map Development)

A road map must be developed to help ensure a successful system. One must identify, prioritize, and budget for the following:

- Information products (maps and applications)
- Training and staffing
- Data and information systems that need to be acquired, developed, or integrated
- Computer infrastructure
- GIS software



Systems Infrastructure Best Practices

It is important that adequate computing and network infrastructure is allocated to support GIS for RTCCs. As part of the road map for development, a GIS must review existing computing environments and business systems to ascertain best practices for implementation. Below is a sample conceptual architecture that will support the agency:

- Crime data
- Accident data
- Calls for service
- Connection with other databases, including Microsoft and many other software packages that use large flat files (comma separated, fixed width, etc.)
- Video feeds
- AVL data
- LPR data
- Offender location data
- Local datasets, including political boundaries such as beats, demographic blocks, and jurisdictional Boundaries
- Most any type of satellite imagery
- Connectivity with other databases (Sometimes, critical law enforcement data is contained in local databases such as SQL® Server. A GIS should be able to connect to databases that are in either read only or read and write configurations.)

Next Steps

GIS can be used to transform any police agency into an organization that is prepared to respond to any situation. By employing a GIS-enabled solution, an organization of any size can and will be ready to respond to any threat, at any time.

Before deploying any GIS, an organization should take the time to review its current needs and capabilities and desired future capabilities. While the law enforcement mission in

Conclusion

Esri® ArcGIS® software is a complete platform for standing up an RTCC. It's affordable and scalable; fits into existing IT; and brings together data from many different sources into an easy-to-understand, smart interface. With ArcGIS as the RTCC platform, an

agency's systems and data sources are transformed into real-time intelligence tools that quickly and reliably inform field officers before they arrive on-scene. ArcGIS cutting-edge technology integrates with CAD systems and RMS; connects many other types of software packages; and can incorporate camera feeds, LPR data, AVL data, and many other nontraditional data sources. This flexibility enables Esri to meet the needs of any agency, regardless of size or budget. Beyond the organization, Esri also promotes data sharing and community partnerships, fostering greater collaboration and problem solving both locally and regionally through its extensive partner network and user communities. This network of law enforcement users implementing a common platform provides knowledge exchange and best practices. Through the powerful combination of knowledgeable staff, a ubiquitous platform, valued partners, and strong user support, Esri provides what is needed to quickly get up and running with a complete RTCC. It also means agencies will have a long-term partner in Esri that will work to help them succeed •

Thermal Imaging for Crime Monitoring

Introduction

Thermal image processing has a long history, although its use has increased dramatically with the defense, homeland security, crime monitoring and other stakeholders of surveillance in the present global scenario. Thermal infrared sensors detect the radiation in the Thermal Infrared (TIR) range of electromagnetic spectrum (roughly 9,000–14,000 nanometers or 9–14 μm) and produce images of that radiation, called thermal images. Since infrared radiation is emitted by all objects above absolute zero according to the black body radiation law, thermal sensors like ASTER, Landsat, MODIS, AVHRR and airborne thermal sensors makes it possible to see one's environment with or without visible illumination. The amount of radiation emitted by an object increases with temperature; therefore, thermal images allows one to see variations in temperature and identify temperature anomalies associated with geothermal activity with the help of high end image processing software like ENVI.



Fig 1: Normal Image and Thermal Image extensively in the present Indian scenario to monitor the terrorism, crime, security surveillances in the remote, sensitive, commonly non trafficable and Unappeasable areas.

Thermal sensor like Landsat TM and ETM+ acquire temperature data and store as digital number (DN) with a range between 0 and 255. Using ENVI software it is possible to convert these DNs to degrees Kelvin using a three step processes as mentioned below:

Convert DN to Radiance

Landsat Image in USGS GeoTiff with metadata format:

Inbuilt Landsat calibration tool can be utilized effectively to convert thermal DN to Kelvin. If the data are not in the original USGS "GeoTIFF with Metatdata" format in that case below are formulas to use within the Band Math tool of ENVI to convert DN to Kelvin:

Gain and Bias Method

The formula to convert DN to radiance using gain and bias values is:

$$CV_{R1} = gain * DN + bias$$

Where:

CV_{R1} is the cell value as radiance DN is the cell value digital number gain is the gain value for a specific band bias is the

bias value for a specific band

The ENVI formula in Band Math will look like:

$$0.05518 * (B1) + 1.2378$$

Using a scene specific gain value of 0.05518 and an offset value of 1.2378. In the Band Pairing dialog you should match B1 with the thermal band.

Spectral Radiance Scaling Method

The Formula used in this process is as follows:

$$CV_{R1} = \left(\frac{LMAX_{\lambda} - LMIN_{\lambda}}{QCALMAX - QCALMIN} \right) * (QCAL - QCALMIN) + LMIN_{\lambda}$$

Where:

CV_{R1} is the cell value as radiance

QCAL = digital number

LMIN_λ = spectral radiance scales to QCALMIN

LMAX_λ = spectral radiance scales to QCALMAX

QCALMIN = the minimum quantized calibrated pixel value (typically = 1)

QCALMAX = the maximum quantized calibrated pixel value (typically = 255)

The ENVI formula in Band Math will look like:

$$((15.303 - 1.238) / 254) * (B1 - 1) + 1.2378$$

Using scene specific values for LMax of 15.303 and LMin of 1.2378. In the Band Pairing dialog you should match B1 with the thermal band.

Atmospheric Correction

Atmospheric correction can be done using inbuilt atmospheric modules of ENVI. Here the atmospheric correction formula from Collet al 2010, the formula to apply scene-specific atmospheric correction is:

$$CV_{R2} = \frac{CV_{R1} - L_{\uparrow}}{\epsilon \tau} - \frac{1 - \epsilon}{\epsilon} L_{\downarrow}$$

Where:

CV_{R2} is the atmospherically corrected cell value as radiance

CV_{R1} is the cell value as radiance from Section 1

L_↑ is upwelling Radiance

L_↓ is downwelling Radiance

T is transmittance

ε is emissivity (typically 0.95)

The ENVI formula in Band Math will look like:

$$(B1 - 0.50) / (0.95 * 0.93) - (0.05263 * 0.84)$$

Using the standard emissivity value of 0.95 and scene specific values of 0.93 for T, 0.50 for L_↑ and 0.84 for L_↓. In the Band Pairing dialog you would match B1 to the radiance band calculated is Section 1.

Convert Radiance to Kelvin

Once the DN's for the thermal bands have been converted to radiance values, it is simply a matter of applying the inverse of the Planck function to derive temperature values. The formula to convert radiance to temperature without atmospheric correction is:

$$T = \frac{K2}{\ln\left(\frac{K1}{CV_{R2}} + 1\right)}$$

Where:

T is degrees Kelvin

CV_{R2} is the atmospherically corrected cell value as radiance (from Section 2)

	Landsat TM	Landsat ETM
K1	607.76	666.09
K2	1260.56	1282.71

The ENVI formula in Band Math for a TM scene will look like:

1260.56 / log(607.76 / B1 + 1)

In the Band Pairing dialog match B1 with the atmospherically corrected radiance band.

Application of Thermal Image Data for Crime Monitoring

Using thermal image analysis capabilities of ENVI software the law enforcement officers and other stakeholders of surveillance system can achieve a reliable information from heat picture of their surroundings, providing them a range of abilities to effectively manage surveillance activities, locate



Fig 2: A suspect peering around a bush does not realize he is being monitored by a thermal imager, as there is no tell-tale beam projected at him.

and apprehend suspects, investigate crime scenes and conduct search and rescue operations. Fugitive Searches

While most people understand how to hide from sight, they rarely consider hiding their body heat. When ambient light, flashlights or searchlights fail to illuminate a suspect, there is still a good chance that the suspect's body heat is visible to the thermal imager. This makes detection, tracking and apprehension easier. Additionally, since the thermal imager does not project any beam, the suspect is unaware that he is being monitored.

Surveillance

Because the thermal imager does not require light and only receives heat energy, it can be used to observe potential criminal activity at a distance. Whether a suspect is dealing drugs on the street, or trying to steal purses and stereos from cars, low-light conditions work to his benefit. An officer can use a thermal imager to observe the suspect from a distance, watching his activity and building further reasonable suspicion or probable cause. The thermal imagery can be recorded for use as evidence later, or it can be used to justify specific interaction with the suspect.

Officers with thermal imagers can also help maintain perimeters when fleeing suspects are confined within a small area. Again, since the thermal imager emits no beams of energy, it will not alert the suspect that the perimeter is monitored, which may lead him to cross the line and be more easily apprehended.



Fig 3: Surveillance

Hidden Compartments

Because the heat signature of a surface is affected by its material as well as its density, hidden compartments can be identified with a thermal imager. When the difference in density between the compartment and the surrounding surface is great, the likelihood of identifying it with the thermal imager is higher. For example, the space in a car door is normally empty. However, if the door is packed with drugs or money, its density will be different in the areas where the contraband is stored. As a result, the thermal image will show a suspicious heat signature that can lead an officer to further investigation.

Collision Investigation

The widespread use of antilock brakes has made collision investigation more complicated. However, even when a skid mark is not visible, a rapidly stopping vehicle still generates a significant heat pattern on the roadway. Investigators can use



Fig 4 : The passenger of this vehicle left a distinct heat impression in his seat, indicating that he may have been thrown from the car in the collision. Rescuers now know to look for an additional victim.

the thermal imager to identify the direction of travel, where a vehicle left the roadway and how long the vehicle was braking. It can also be used to help locate victims, or their belongings, that may have been ejected from the vehicle.

Search and Rescue

Though fire departments normally lead search operations, police officers may frequently arrive first or be asked to assist until sufficient manpower is on hand. Whether the victim is a lost child or a disoriented elderly adult, he or she can be located more quickly and at less risk with the assistance of a thermal imager. A thermal imager can overcome the normal challenges of low-light situations as well as environmental conditions, such as fog or smoke. Many thermal imagers will detect a human at 300 meters or more.

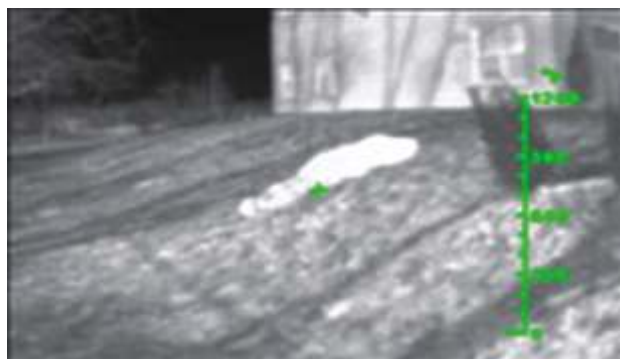


Fig 5: A person lost in the woods or ejected from a motor vehicle can be difficult to locate at night. However, this image shows that the person's body heat is quickly detected by the thermal imager, guiding rescuers promptly to the proper location

Disturbed Surfaces

When earth is removed and replaced in order to hide or remove evidence, the heat signature of the ground is altered. A thermal imager can help detect areas that have been disturbed from their original state, potentially indicating where suspects may have buried evidence. Even structural changes in a wall or on a vehicle may be significant enough to be detected with a thermal imager. Patches made in drywall

Discussion and Conclusion



Fig 8: Thermal image detected suspects

In this global scenario when high end surveillance system is very much important not only to secure and manage the assets but also to secure the life of the human resources, thermal image can be explored and used effectively with the help of high end image analysis software ENVI, developed by Exelis Visual Inc and distributed in India by ESRI India who are equipped with more than 300 highly skilled professional to help Indian space industry for processing and analyzing geospatial imagery generated by IRS satellites. The high end image analysis capabilities of ENVI along with the very close and tight integration with ArcGIS software may help Indian scientists, researchers, image analysts to exploit the image information scientifically and categorically.

Ref:

1. C. Coll, J. M. Galve, J. M. Sánchez, and V. Caselles, "Validation of Landsat-7/ETM+ Thermal-Band Calibration and Atmospheric Correction With Ground-Based Measurements", IEEE Trans. Geosci. Remote Sens., vol. 48, no. 1, pp. 547–555, Jan. 2010.
2. Help article of Yale University (www.yale.edu)
3. Help article of ENVI software
4. Help article of Bullard, USA (www.bullard.com)

to cover bullet holes may have a different temperature than the rest of the wall, indicating anomalies when viewed with the thermal imager. Similarly, vehicles that have undergone rapid repairs through the use of Bondo-type materials may project unique thermal signatures. This can aid in the identification of vehicles that flee collisions.

Marine Patrol

Thermal imagers are ideal in marine applications, as the open expanse of water and limited number of heat sources makes thermal imaging easy and effective. A thermal imager can help marine officers covertly monitor an area for illegal activity, such as drug smuggling, or identifying and tracking "drops" when the smuggled goods are left floating in the water for later pick-up. The heat sources of boats, personal water craft and even swimmers will contrast starkly to the background temperatures of the water and shoreline; this makes locating, monitoring and tracking them relatively easy. A thermal imager can also help officers locate boaters and swimmers in distress, even in moderate fog.

A thermal imager will not see through water, however, so it cannot identify boats, evidence or people that are completely submerged.



Fig 6: In total darkness, a swimmer in distress is found struggling in the water

Esri India at IGF 2013: Mapping the future with ArcGIS Online

India is becoming one of the emerging economies in the world, building a sustainable technological hub driven by economy. Seeing the vital need, the geospatial technologies find its space in various sectors that are contributing to the nation's economy. Esri India participated at the 15th India Geospatial Forum 2013 from 22-24 January at Hyderabad as a Platinum Sponsors. The forum was focused to the theme "Towards Geospatially-enabled Economy". The forum endeavoured its best to demonstrate and project the aforesaid to larger stakeholders and contributors to the economy. The forum also focused on to various National Programs that are being initiated by the Indian government addressing the need of the geospatial component at the core. The forum also addressed various sectors such as infrastructure, construction, power, water, land, banking, insurance and many more. The conference and exhibition was attended by 1000+ delegates.

The India Geospatial Forum was inaugurated by Danam Nagender, Hon'ble Minister of Labour, Employment, Training & Factories, Industrial Training Institutes, Government of Andhra Pradesh, who emphasized on creating awareness amongst common people about the application and potential of geospatial technologies. Other dignitaries were Dr. Shailesh Nayak, Secretary, Department of Earth Sciences, Government of India, Drs. Th A J Burmanje (Dorine), Chair Executive Board, Cadaster, Land Registry and Mapping Agency, The Netherlands, Dr. Swarna Subba Rao, Surveyor General, Survey of India, Dr. V.K. Dhadwal, Director, National Remote Sensing Centre.

The Plenary Session opened the India Geospatial Forum 2013 with a thought provoking deliberation from the various IT leaders and experts. Speaking at the session Arvind Thakur, CEO, NIIT Technologies said, " 'geography-as-a-service' can guide India towards becoming a geo-enabled economy and



GIS has embraced evolution of IT and the new buzzword cloud". The other plenary speakers at the forum were C. Kandasamy, Director General (RD) & SS, Ministry of Road Transport & Highways, Government of India, Dr. Y.S. Rajan, Honorary Distinguished, Professor, Indian Space Research Organisation (ISRO), India, S. Narsing Rao, IAS, Chairman, Coal India, Rajan Aiyer, Managing Director, Trimble, India, John Graham, President, Intergraph SG&I, United States, Rakesh Verma, Managing Director, MapmyIndia.

A Special Panel Discussion "Geospatial State Panel" was organised for the various stakeholders from the State Governments. The Panelist of the forum were S. Sridhar, President & COO, Esri India, Bipul Pathak, IAS, Secretary-IT, Jammu & Kashmir, Sanjay Jaju, IAS, Secretary-IT, Andhra Pradesh, Kaushik Chakraborty, Vice President, Hexagon India, Prof Arup Dasgupta, Managing Editor, Geospatial

World and Dr CR Bannur, Senior Divisional Director, EnterpriseGIS & Defence Solutions, Rolta India.

The panel discussed A seamless, standard based, citizen friendly state GIS is required now. Also there is a Need to integrate IT and IT-enabled services so that each can take benefit from the other and geospatial technologies can lap up at that scale. Making sure Administrative structures need to be created for the smooth flow of any project and resolve issues of interoperability of datasets, availability of capacity, funding are impeding the speed of the projects.

A Day long Symposium was organised in collaboration with NSDI on Building National Data Repository. This symposium was aimed at GIS becoming a critical national infrastructure, demanding effective management and Geospatial data has potential for major economic contribution to national development. National repository needs to become a key component in a 'dynamic ecosystem' providing a marketplace to find, use and publish services. Rajesh Mathur, Vice Chairman, Esri India, one of the Keynote Speakers at the Symposium mentioned "One of the key requirements is an integrated geography platform that leverages the new medium of intelligent Web service". The other speakers

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Esri India draws interest at GeoIntelligence India 2013



GeoIntelligence 2013, a two-day conference focused on India's Defence and Homeland Security, was rolled out on June 13-14, in New Delhi. The conclave drew 400 attendees from the Indian Army, Navy and Air Force. The meet was centered around the theme, 'Geospatial: Force Multiplier for Modern Warfare'. The inaugural session featured keynotes by the top brass of the Indian Army and Navy, who addressed defense staff from various departments. In his speech, Lt. Gen. Anil Chait GOC-in-C, Central Command, Indian Army, provided a soldier's perspective of geospatial technology as a force multiplier. Talking about the changing landscape of warfare, he said that the very notion of victory was undergoing a sea change. He also pointed to the shift taking place from defense to security and the fact that current day wars were taking place in an information dominated world where there was a lot of emphasis on the cognitive domain. The inaugural address, delivered by Admiral D.K. Joshi, Chief of Naval Staff, the Indian Navy, was focused on the myriad ways geospatial technology was impacting life and living. He acknowledged the contribution of the Survey of India, National Hydrographic Office and the Indian Space Research Organisation in creating geospatial data, applauding NSDI for bringing all the data providers in the country together. Admiral Joshi said that timely availability, integrity and security of information however, still remained a challenge. Space-based geospatial data, he said, was susceptible to non-disruptive destruction.

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during the forum were Dr. R. Siva Kumar, Chief Executive Officer, National Spatial Data Infrastructure, Dr. R. Nagaraja, Group Director, NRSC, Mladen Stojic, Vice President – Geospatial, Intergraph and Maj. Gen. R. C. Padhi, Additional Surveyor General, Survey of India.

The other Symposiums and seminars that were organised were National Development Programs, State SDIs, Geospatial for Business Enterprises, Mining & Exploration, SME forum, Student Forum etc. This was followed by Technical Sessions on Web Applications and Open Source, Remote Sensing and Image Processing, Local Governance, Geospatial Enterprise

The problem then was to integrate the data produced by different organisations and create applications. In his view, while there were different organisations developing applications in the civilian domain, there was a need to harness the potential of geospatial information by developing applications in the military arena.

John Day, Director-Global Defence, Esri USA spoke at the first plenary session of the GeoIntelligence India conference. Speaking about 'Special Operations' he said that GIS was not about maps. Rather, it was about what could be done with maps and systems which could communicate with each other. "A network-centric environment provides for sharing of information. We are moving towards intelligent systems which can share information with each other", he added. Some of the other issues that were spotlighted at the meet included Weaponisation of space, Cyber Warfare, Internal Security and Border Management, importance of GeoIntelligence for special operations, geo-analysis of crime, Maritime security, Image interpretation and terrain modeling, among others.

Esri India as well as Esri USA participated in the exhibition that was focused on the need for GeoIntelligence systems in India. Our team showcased the capabilities of GIS, particularly its critical defense and intelligence features and success in various warfare activities. Whether assessing potential terrorist targets, or deciding where to locate a new building with minimal environmental impact, geography always came into the equation, the Esri team pointed out. Esri also demonstrated its Portal for ArcGIS, Image Mosaic Viewer and Full Motion Video, 3D visualisation in a mobile device and ArcGIS for Maritime Ops at its booth •

Solutions, Agriculture and Mobile Mapping.

Esri India also participated in the Exhibition that was inaugurated Dr. Shailesh Nayak, Secretary, Department of Earth Sciences, Government of India. The exhibitors were the majors players from the GIS industry focusing on their GIS product and service deliverables. The Exhibition was attended from various stakeholders both from the government and private sector and various GIS users and academia. Esri India focused on its theme "Geography as a Service Platform" giving a new technological dimensions in the GIS Domain. We talked about our upcoming platform ArcGIS online which gave new wave into Cloud GIS •

NATIONAL INSTITUTE of TECHNOLOGY, WARANGAL



Introduction National Institute of Technology, Warangal (Deemed University), formerly known as Regional Engineering College, was established in the year 1959, the first in the chain of 30 NITs (formerly known as RECs) in the country. The present Director of Institute is Prof. Dr T Srinivas Rao.

The Institute is well known for its dedicated faculty, staff and the state-of-the art infrastructure conducive to a healthy academic environment. The Institute is constantly striving to achieve higher levels of technical excellence. Evolving a socially relevant and yet internationally acceptable curriculum, implementing innovative and effective teaching methodologies and focusing on the wholesome development of the students are our concerns. Thanks to UNESCO and UK assistance in the past, many developmental activities were undertaken. The World Bank Assistance under Technical Education Quality Improvement Programme (TEQIP during 2004-09) had been a timely help in the overall development of the Institute.

The Institute relentlessly strives to achieve higher levels of technical distinction, and is very actively involved in Research and Development, Industrial consultancy, and continuous programmes in education, training for teachers and industrial personnel. The institute has 8 Engineering departments which provide Under Graduate, Post Graduate and research programmes. NIT-W also has 4 sciences departments along with a School of Management. The most notable engineering department is Civil Engineering.

Department of Civil Engineering

The Department of Civil Engineering has been one of the pioneering academic departments of the National Institute of Technology, Warangal since the inception of the institute in 1959. The Department has well qualified, experienced and motivated faculty members. The Department offers the following programmes.

- B.Tech
- M.Tech. (Construction Technology and Management)
- M.Tech. (Engineering Structures)
- M.Tech. (Environmental Engineering)
- M.Tech. (Geotechnical Engineering)
- M.Tech. (RS & GIS)
- M.Tech. (Transportation Engineering)
- M.Tech. (Water Resources Engineering)

The Department every year undertakes many R&D projects for

Government organizations and other technical education imparting bodies at both the National and International level. For administrative purposes, four divisions have been set up to cater to different needs of specialization namely,

- Engineering Structures Division,
- Geotechnical Engineering Division,
- Transportation Division &
- Water & Environment Division.

The faculty of Civil Engineering department has broad areas of expertise in the above mentioned divisions and some of the best R&D project works and consultations have been carried out in these areas and some are still underway.

Under the Technical Education Quality Improvement Programme (TEQIP), the department has been recognized as a center for imparting quality education by the Ministry of Human Resources Development, Government of India, since 1978. Realizing the potential of the Department, the following Centers of Excellence have been set up in the Department.

- Centre for Transportation Engineering
- Centre for Water Management
- Centre for Rural Development

Centre for Excellence for Remote Sensing and GIS (In Progress)

The department has a well-established Remote Sensing and GIS lab under the Water and Environment Division headed by Dr. Deva Pratap Reddy and supported by Dr. Venkata Reddy, faculty in charge of the lab. The Department has plans to set up a center of excellence and further strengthen their GIS lab to assist their students and bring about a strategic change in Research and Development and provide continuous support to the GIS user community.

GIS Course & Facilities:

The division has been running a M.Tech Program on Remote Sensing and GIS since the year 2000. The admission to the M. Tech program is based on the GATE performance. The lab is equipped with the ArcGIS software technology of Esri, Inc with multiple licenses of Advanced Desktop version along with Basic version and an Enterprise Advanced Server for developing applications and to impart training to students. The department is also equipped with other GIS, Image processing and Digital photogrammetry equipment such as Erdas Imagine, ILWIS, Light Tables, Additive Color Viewer, Ground Truth radiometer, Procam-II etc.

For More details, Please Contact :

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Email: kvreddy@nitw.ac.in

Designing task assistant workflows

The following tips and tricks below can help you get started on designing task assistant workflows.

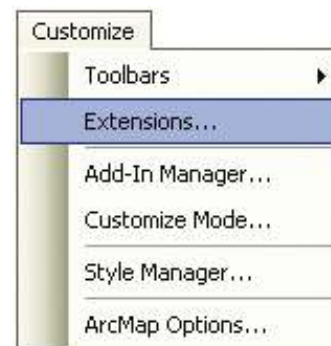
- Use the description element and node styles to provide information to the user about the functionality and what interaction is required of the user for a step in the workflow.
- Include information in the step name to convey information to the user. Including Tool in the step name can indicate that a tool that requires user interaction will be enabled. Using '...' (for example, Modify Attributes...) can indicate that a step will open a dialog box. If a step does not execute anything, you may include some indication such as Note:. If a step is optional or is part of a choice, indicate it as such using "OPTIONAL:", "EITHER," or "OR".
- Use steps as containers to group tasks that are sequential. For example, separate tasks into groups for creating a feature versus selecting and modifying a feature. The step for grouping subtasks, also known as the parent or container step, should not execute any process.
- A single step can execute many different things. For example, a single step can copy and paste graphics or set a layer as visible and selectable. Using the tool palette to combine multiple tools to be used sequentially is best designed for advanced users that understand the proper order for using certain tools; for example, Select by Rectangle and Reshape.
- Steps that do not execute any process can be used as placeholders for a process that cannot be automated or for conveying information. Use the help style node or some notation to indicate to the user that the step is a placeholder. For example, you can preface each placeholder step with Note:.
- Two distinct tasks may require similar steps, such as create new features from existing features. Depending on the complexity of the task and the skill set of the user, you can group common tasks in a container or repeat tasks in each workflow a user can follow. That is, if the users are more experienced, they can have a more general workflow to follow; less-experienced users can be given more guidance.
- Do not change the data frame after editing has been



started.

- Data frames and data can be added to or removed from an ArcMap document using Task Assistant. Be careful when performing these actions in a workflow as any subsequent commands that access the data frame or data layer may not necessarily execute.
- Task assistant workflow files are XML based and reference all configuration elements by name. This can cause some unexpected results for layers and feature templates when your map document contains multiple layers with the same name or multiple feature templates with the same name in the same layer. Take care with designing the map document that accompanies any task assistant workflow to reduce these limits.

Using Extensions in ArcGIS



Extensions

To use an extension for which you are registered or licensed, it must be enabled in the application in which you will use it.

Enabling Extensions

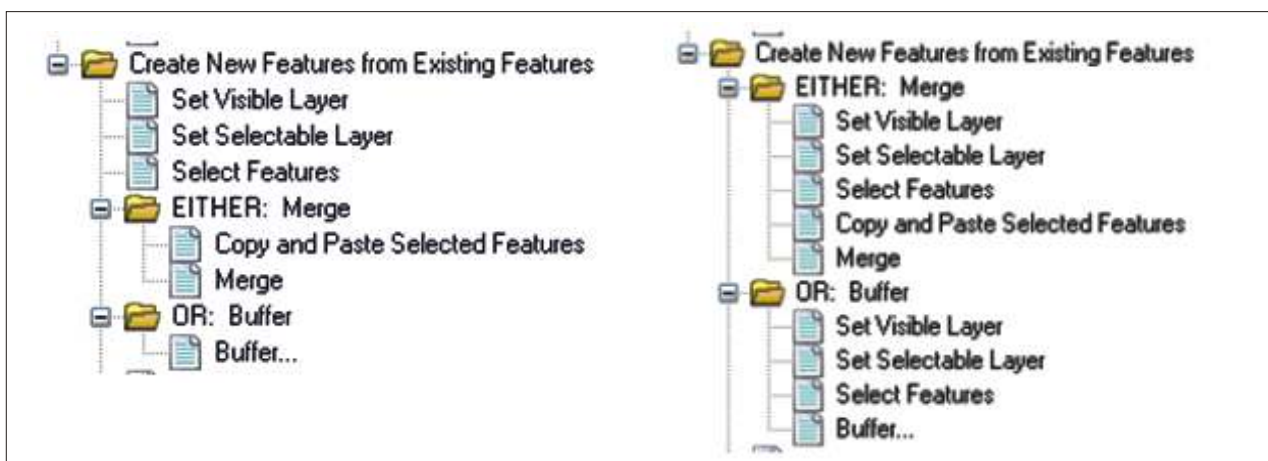
To enable an extension, select Extensions from the Customize menu in

ArcMap, ArcCatalog, ArcGlobe, or ArcScene (the application that comes with the ArcGIS 3D Analyst extension).

The Extensions dialog box lists the extensions currently installed on your system that work with the application you are using. For example, if you are using ArcCatalog, you'll only see extensions listed that work with ArcCatalog. Extensions are listed in this dialog box whether or not you have registered them or whether or not licenses are currently available for them on your License Manager.

To enable an extension, check the box next to it:

If the extension is successfully enabled, the box will appear checked.



Example of a streamlined workflow with common tasks grouped together

Example of a workflow that provides tasks wherever they are needed

Activating toolbars

Enabling an extension does not cause the extension's user interface to appear automatically; it simply enables any controls that the extension provides. If the extension's controls are on a toolbar, such as the ArcGIS Spatial Analyst extension toolbar, you will still need to display the toolbar by choosing it from the Toolbars pull-right menu in the View menu.

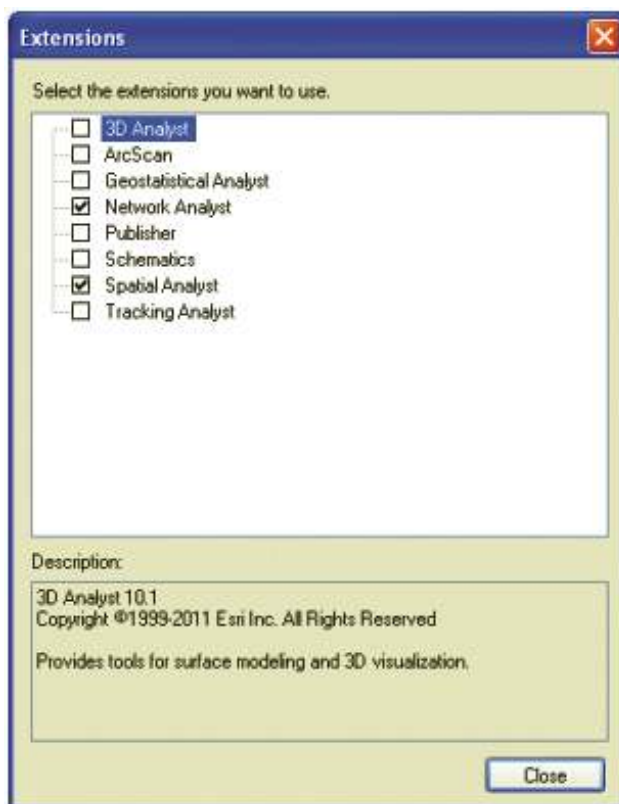
Toolbar activation example

Registering an extension

ArcGIS for Desktop Basic or ArcGIS for Desktop Standard (single use)

If you're using the ArcGIS for Desktop Basic or ArcGIS for Desktop Standard single use product, you must first register the extension with ESRI. To register an extension, start ArcGIS for Desktop Administrator from the Windows Start menu, click the Register ArcGIS for Desktop Basic (Single Use) and Extensions folder, then click the Register Now button to start the Registration Wizard.

If you try to enable an extension in the Extensions dialog box that has not been successfully registered and authorized (or if an autoenabling extension attempts to enable itself), you'll get a message, and the next time you open the Extensions dialog box, you'll see this next to the extension.



If all the concurrent use licenses for the extension are currently in use by other users, you won't be able to use the extension until a license becomes available. To see if a license has become available, check the box next to the extension again or, in the case of an autoenabling extension, close the map or data that the extension uses, then reopen it. In either case, if a license has become available, it will be checked out for you, and you'll see a check next to the extension. If you shut down the application and restart it, the application will automatically check to see if licenses are now available for extensions that you previously tried to use and will check them out for you if they are.

If you are currently using a concurrent use license and you want to make it available so someone else can use it, simply uncheck it or, in the case of an autoenabling extension, close the map or dataset that the extension uses. Shutting down the application will also free up any concurrent use licenses you were using.

Can I open a map that uses an extension that isn't currently enabled?

Yes. ArcMap will let you open any map regardless of which



Concurrent use products

If you're using the ArcGIS for Desktop Basic, Standard, or Advanced concurrent use (floating) product, a license must be currently available on your license manager for you to enable an extension in the Extensions dialog box.

When you click an extension in the Extensions dialog box to enable it (or when an auto enabling extension attempts to enable itself), the application will try to obtain a license from the License Manager. If a license cannot be obtained, you'll get a message, and the next time you open the Extensions dialog box, you'll see this next to the extension:

Here are the typical reasons a license is not available:

- You have not licensed the extension from Esri, so it's not on your License Manager.
- All the available concurrent use licenses for this Extension are currently in use by other users.
- The license has timed out and needs to be renewed.
- You have not borrowed the required extension license from your license manager before disconnecting your machine from the network.

extensions are currently available in the Extensions dialog box. However, data or functionality in the map that depends on a particular extension will not be available if no license is available for that extension. When you open a map containing data that requires an autoenabling extension, such as StreetMap, you won't be able to use that data if the required extension is unable to obtain a license. Layers referencing this data will be disabled in the ArcMap table of contents with a red exclamation mark next to them.

Generate Reference Tool Functionality

The Generate Reference Tool functionality is used to draw a point on the map and based on the point a buffer of distance 100 m should be generated and all the features (point, line and polygon) of the layers (selected by user pre-drawing the point) should be selected. Along with this a line of shortest path (sometimes perpendicular to the feature) should be drawn automatically and displayed along with the label of distance between the point drawn and feature selected.

The major task is to generate line of shortest path for polygon and polyline features since polygon and polyline both are point collections which are produced during digitization. And the point required is different from these points already contained in point collections.

Code for Generate reference tool

```

///<summary>
    ///All the functions in this region are used to densify each
    feature in the featureset selected.
    ///</summary>
    ///<param name="GL"></param>
    ///<param name="Densify_Param"></param>
    #region Densify task
    private void Densify_Task_Polyline(GraphicsLayer GL,
    DensifyParameters Densify_Param)
    {
        Geometry_Service_1.DensifyCompleted +=
        new EventHandler<GraphicsEventArgs>(GeometryService_D
        ensifyCompleted1);

        Geometry_Service_1.Failed +=
        GeometryService_Failed;

        try
        {
            Geometry_Service_1.DensifyAsync(GL.Graphics.
            ToList(), Densify_Param);
        }
        catch (Exception)
        {
        }
    }

    Private void Densify_Task_Polygon(GraphicsLayer
    GL, DensifyParameters Densify_Param)
    {
        Geometry_Service_2.DensifyCompleted +=
        new EventHandler<GraphicsEventArgs>(GeometryService_D
        ensifyCompleted2);

        Geometry_Service_2.Failed +=
        GeometryService_Failed;

        try
        {
    
```

```

        Geometry_Service_2.DensifyAsync(GL.Graphics.
        ToList(), Densify_Param);
        }
        catch (Exception)
        {
        }
    }

    private void GeometryService_DensifyCompleted1(object
    sender, GraphicsEventArgs e) // event complete
    {
        foreach (Graphic g in e.Results)
        {
            int counter = 0;
            ESRI.ArcGIS.Client.Geometry.Polyline p =
            G.Geometry as ESRI.ArcGIS.Client.Geometry.
            Polyline;
            ESRI.ArcGIS.Client.Geometry.PointCollection pc =
            P.Paths[0];
            Count_Points_In_Ring = pc.Count;
            Dis = new double[Count_Points_In_Ring];
            X = new double[Count_Points_In_Ring];
            Y = new double[Count_Points_In_Ring];
            foreach (MapPoint Point in pc)
            {
                MapPoint coordinates =
                initial_point.GeographicToWebMercator();
                double d = Math.Sqrt(Math.Pow((coordinates.
                X - Point.X), 2) + Math.Pow((coordinates.Y -
                Point.Y), 2));
                double inmeter = 1000 * d;
                Dis[counter] = Math.Round(d, 4);
                X[counter] = Point.X;
                Y[counter] = Point.Y;
                counter++;
                //Graphic g1 = new Graphic();
                //g1.Geometry = Point;
                //g1.Symbol =

                this.CurrentApp.Resources[SymbolResources.SIMPLE_MARK
                ER] as SimpleMarkerSymbol;

                //GraphicsLayer.Graphics.Add(g1);
            }

            double smallest = Dis[0];
            MapPoint CheckPoint = new MapPoint();
            CheckPoint = new MapPoint(X[0], Y[0],
            new SpatialReference(3857));
            for (int i = 0; i < Count_Points_In_Ring; i++)
            {
                //largest and smallest//
                if (Dis[i] < smallest)
    
```



```

    {
        smallest = Dis[i];
        CheckPoint = newMapPoint(X[i], Y[i],
            newSpatialReference(3857));
    }
    CheckSmallest = smallest;
}

//MapPoint check =new
final_point = CheckPoint.WebMercator
ToGeographic();add_graphic3(initial_point,
final_point); this.IsBusy = false;
}
}

privatevoid GeometryService_Densify
Completed2(object sender, GraphicsEventArgs) //
event complete
{
    foreach (Graphic g in e.Results)
    {
        int counter = 0;
        ESRI.ArcGIS.Client.Geometry.Polygon p =
g.GeometryasESRI.ArcGIS.Client.Geometry.Polygon;
        ESRI.ArcGIS.Client.Geometry.PointCollection pc =
p.Rings[0];
        Count_Points_In_Ring = pc.Count;
        Dis = newdouble[Count_Points_In_Ring];
        X = newdouble[Count_Points_In_Ring];
        Y = newdouble[Count_Points_In_Ring];
        foreach (MapPoint Point in pc)
        {
            MapPoint coordinates =
initial_point.GeographicToWebMercator();
            double d = Math.Sqrt(Math.Pow((coordinates.
X - Point.X), 2) +
            Math.Pow((coordinates.Y - Point.Y), 2));
            doubleinmeter = 1000 * d;
            Dis[counter] = Math.Round(d, 4);
            X[counter] = Point.X;
            Y[counter] = Point.Y;
            counter++;
        }
        double smallest = Dis[0];
        MapPointCheckPoint = newMapPoint();
        CheckPoint = newMapPoint(X[0], Y[0],
            newSpatialReference(3857));
        for (inti = 0; i<Count_Points_In_Ring; i++)
        {
            //largest and smallest//
            if (Dis[i] < smallest)
            {
                smallest = Dis[i];
                CheckPoint = newMapPoint(X[i], Y[i],
                    newSpatialReference(3857));
            }
            CheckSmallest = smallest;
        }
        //MapPoint check =new
        final_point = CheckPoint.WebMercator
        ToGeographic();
        add_graphic2(initial_point, final_point);
        this.IsBusy = false;
    }
}
#Endregion

```

Letters to Editors

Dear Readers,

This section of Letters to Editors has been an important section of Arc India News and your comments/suggestions are valuable to us. We would like to have the opinion and feedback of all our readers with respect to the content being published and how its has been useful to them in day to day GIS advancement. You may also let us know what you expect to see in terms of application and technology in the magazine.

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Esri and Witt O'Brien's Introduce Online Platform for Contingency Planning and Response

Incident Management in the Cloud to Improve Emergency Operations

Esri and Witt O'Brien's, LLC, have built a new GIS cloud service that will increase an organization's capabilities to prepare for, respond to, and recover from incidents. For the first time, emergency management personnel can visualize an integrated Incident Command System (ICS) through a common operational picture (COP) and systematically command, control, and coordinate multiagency emergency response.

"The ability to communicate real-time situational awareness across both the incident management organization and those affected stakeholders is key to a successful response and recovery," said James Lee Witt, executive chairman of the board, Witt O'Brien's. "The integration of our emergency response management technology solutions, coupled with Esri's online GIS platform, will help our partners in government and the private sector better manage their response effort while enhancing collaboration across geographic and organizational boundaries."

First responders, government agencies, and private/commercial industries will have the combined ability to respond faster, control resources better, and generate timely incident reports accurately. The new COP will improve their vital communication and coordination capabilities and give them complete enterprise visibility.

The integration of real-time information provided by Witt O'Brien's ICS software with Esri's GIS platform, via online services, will transform the future of incident management. This is further expected to open up new possibilities that have positive implications across many other sectors of the incident management and response industry.

The combined technologies in the COP simplify the complex process of ICS and increase the agility and capabilities of managers dealing with disasters of various sizes and scopes. Witt O'Brien's CommandPro automates emergency management processes. Esri's ArcGIS Online platform provides users with access to fit-for-purpose maps and workflow-enabled apps (e.g., mobile). The integrated solution aligns real-time data with the systematic approach of ICS. An added value is that COP users can access Esri's emergency management map templates, which incorporate adopted standards for spatial data and real-time incident management.

The prototype of the CommandPro and ArcGIS Online COP has been used for various high-profile projects and incidents. These include many oil and gas readiness projects in which the COP adhered to heightened government efforts for deep-water operations safety.

Property Loss Research Bureau Releases New Esri Mapping Service

Claims Adjusters Can View Maps with Real-Time Weather Information on Mobile Devices

Esri announces that the Catastrophe Services Department of the Property Loss Research Bureau (PLRB) has released a mobile version of PLRB Map, a mapping service that provides real-time severe occurrence data and information to members of PLRB, an association of 900 property and casualty insurance companies. Esri Gold Tier partner GeoDecisions created this new service on the Esri ArcGIS platform. The service provides improved access to interactive maps across member organizations, from mobile workers to analysts in the central office.

Using the ArcGIS platform has permitted PLRB to leverage the distribution of real-time, as well as historical, data to members' claims departments. The interactive PLRB Map service helps move critical research functions from the adjuster's desktop to the mobile device. "It enhances the efficiency of the adjuster in the field by pulling in relevant information, ranging from address-specific PLRB data files to post-catastrophe satellite images, through the power of GIS technology," Strawn said.

The new PLRB Map provides members with a daily map service detailing severe weather, seismic, and technological

occurrences that are likely to generate catastrophe claims for member company insurers. Having access to the location of these incidents can help insurers understand potential claims exposure following the events.

The latest PLRB Map incorporates Esri's ArcGIS Online that allows organizations to create interactive maps and apps and easily share them with others. Incorporating this solution makes it easy for PLRB to provide the detailed information its members need to make the best decisions during the claims management process and ultimately deliver great customer service.

"We are pleased to work with industry leaders like PLRB. Our partnership with GeoDecisions has helped deliver the best technology possible to this outstanding organization. Using Esri technology, they have access to so much more data, which helps them shorten the time it takes to get people back on their feet," said Mark McCoy, insurance solution manager at Esri.

For more information on how Esri helps insurers understand the importance of location, visit esri.com/insurance.

Did you Know that...

Mapping Redefined

In a word, geography is a science—a thing not of mere names but of argument and reason, of cause and effect.—William Hughes, 1863

From the dawn of humankind, man has sketched crude abstractions of geography on cave walls and rocks. These early maps documented and communicated important geographic knowledge our ancestors needed to survive:

- What is the best way to get from here to there?
- Where is the water at this time of year?
- Where is the best place to hunt animals?

Our ancestors faced critical choices that determined their survival or demise, and they used geographic information stored in map form to help them make better decisions. Fast-forward to the 1960s. The world had become significantly more complex than it was for our early ancestors, and computers had arrived on the scene to help us solve increasingly complex problems. The 1960s were the dawn of environmental awareness, and it seemed a natural fit to apply powerful new computing technology to the serious environmental and geographic problems we were facing. And so the geographic information system (GIS) was born.

The era of computational geography was led by the groundbreaking work of Dr. Roger Tomlinson, who developed the Canada Geographic Information System in 1967. Similar efforts took place at Harvard's Laboratory of Computer Graphics and Spatial Analysis in the 1960s and beyond. Computational geography forever changed the way we view geography and place.



Early man used cave walls and rocks as a canvas to communicate and share geographic knowledge.

Today, GIS has evolved into a crucial tool for science-based problem solving and decision making. GIS uses the power of information technology to examine geographic knowledge in ways that would be extremely time-consuming and expensive if done manually. The map metaphor remains the dominant medium for sharing our collective geographic intelligence, and widespread use of GIS technology is creating a revolution in how we understand our world and plan for the future.

A Context for Understanding

Geographic knowledge is information describing the natural and human environment on the earth. For our ancestors, geographic knowledge was crucial for survival. For our own



GIS is the technology of our times and is uniquely suited to assist in solving the problems that we face.

—Roger Tomlinson

Dr. Roger Tomlinson pioneered the development of GIS, ushering in the era of computational geography.

survival today, geographic knowledge plays an equally important role. The biggest differences between then and now are that our problems are much more complex, and the sheer volume of data at our disposal is daunting. And whereas communicating geographic knowledge in the past was limited to simple maps, GIS technology now enables a collective geographic intelligence that knows no spatial or temporal bounds.

Today we have more geographic data available than ever before. Satellite imagery is commonplace. Scientists are producing mountains of modeled data. And an ever-increasing stream of data from social media, crowdsourcing, and the sensor web is threatening to overwhelm us. Gathering all this information—this geographic knowledge—and synthesizing it so that we can more easily understand it and act on it is the domain of GIS. More data does not necessarily equate to more understanding, but GIS is already helping us to make sense of it all, turning this avalanche of raw data into actionable information—a new context for understanding our world and planning for the future.

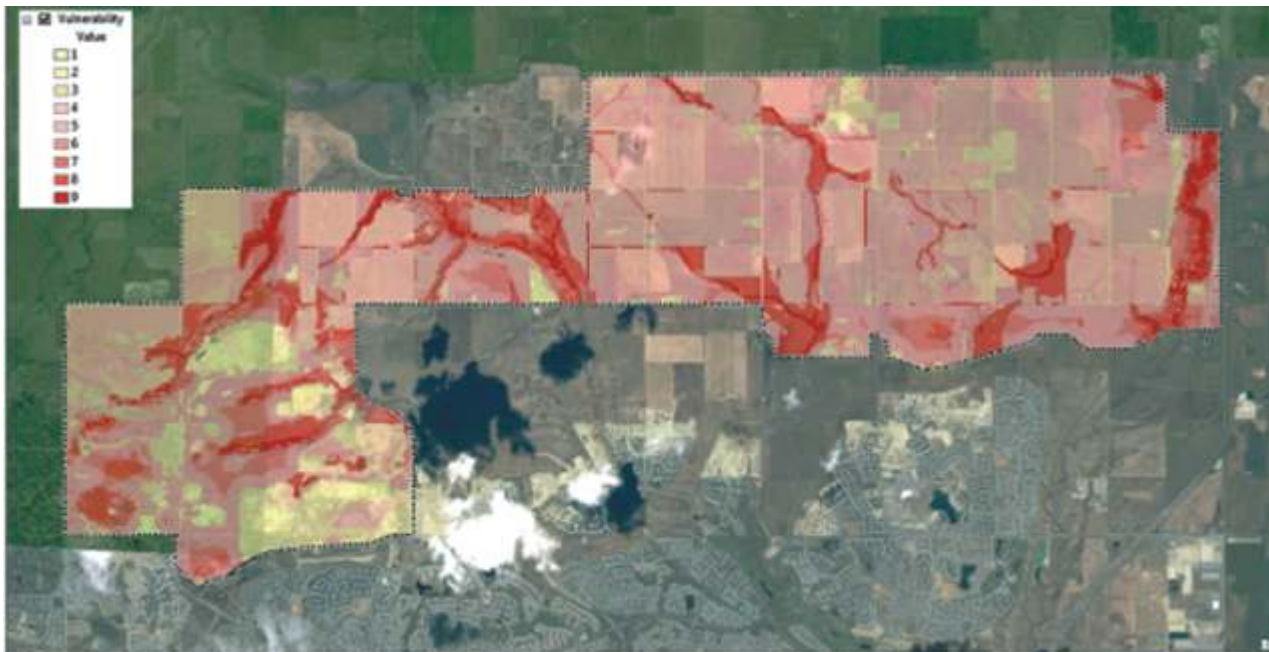
Only when people know will they care.
Only when they care will they act. Only
when they act can the world change.

—Dr. Jane Goodall

A Framework for Action

Our traditional understanding of ecosystems as natural landscapes is changing. Anthropogenic factors are now the dominant contributor to changing ecosystems. Human beings have not only reshaped the physical aspects of the planet, in some cases literally moving mountains, but also profoundly reshaped its ecology.

And it's not just landscape-scale geographies that can be considered human-made ecosystems. In modern society, cities and towns are where we spend the vast majority of our waking and sleeping hours. Even our homes and office



GIS helps us understand the vulnerability of the environment to our actions.

buildings are themselves man-made ecosystems—vast assemblages of interdependent living and nonliving components. Entirely manmade ecosystems have become the primary habitat for the human species, and this is changing the way we think about, collect, store, and use information describing our environment.

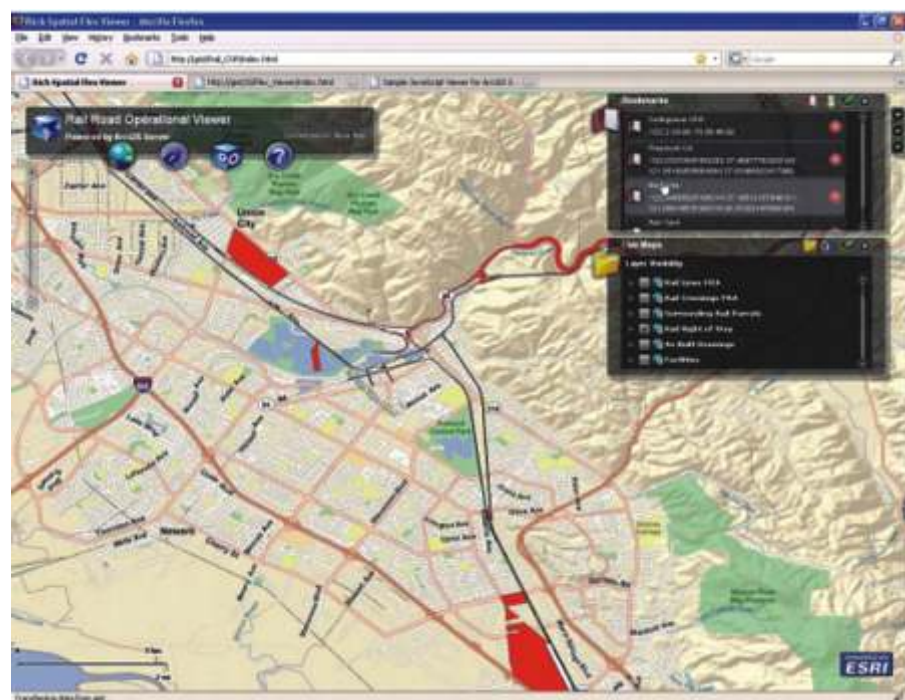
A key aspect of our social evolution is recognizing the effects we have already had on ecosystems, as well as learning to predict what future impacts will result from our actions. Once we achieve this level of understanding, we can direct our actions in a more responsible manner. This type of long-term thinking and planning is one of the things that make us human. Recognition of the overwhelming dominance of man-made ecosystems also makes us cognizant of the tremendous responsibility we have—the responsibility to understand, manage, and steward these ecosystems with decisions based on sound science.

Understanding precedes action.

—Richard Saul Wurman

Our Geospatial Infrastructure

People intuitively understand maps, and maps have historically been our best method for communicating geographic knowledge. But over the last 10 years, we have seen a fundamental change in the way geographic knowledge is delivered and used. Thanks in large part to the Internet, our definition of what constitutes a "map" is



Our geospatial infrastructure includes details about physical infrastructure and other aspects of our natural and human-made geography.

evolving quickly, along with geospatial information management technologies, including GIS.

The next 10 years will see an explosion of faster, more powerful mobile devices, and the line dividing cell phones and personal computers will fade. Mobile devices will continue to grow to support more geospatial functionality, and they will easily connect to GIS-enabled systems around the world, empowering people to use and also create geographic knowledge. Democratization of data—both its widespread use and its universal creation—will result in a new kind of infrastructure: a geospatial infrastructure. Over time, society will become increasingly dependent on this geospatial infrastructure, much as it has become dependent on other, more traditional forms of infrastructure such as electrical grids or highway networks.

ENVI FAQs

Working with ENVI Image Processing

Q: I have received license for MAC OS – but software is not working – why?

A: On Mac OS X, software use the mac id associated with "en0" but occasionally, the Flexnet Host ID that is picked up by our licensing software will be associated with "en1" rather than "en0". Unfortunately, this happens intermittently. It is recommended to use "hostname" command will return the Host Name for the computer. The ".lmhostid" command will return the Host ID of the computer. Alternatively install our software first and then using our software to find the Host ID (License wizard > "Request a license if you don't have internet access"> Generate the text file with host id & host name)

Q: Output of FLAASH reflectance values are above the range of 0 to 1 – why?

A: By default FLAASH output is scaled by 10,000 as specified in the Advanced Parameters of FLAASH. To resolve the issue you can divide the data by 10000 (ENVI > Band Ratio > Band Math > b1/10000).

Q: How can I associate image and DEM of same area? So that whenever I will open image, the DEM will load automatically?

A: Use 'Edit ENVI Header' tool (ENVI > Raster Management > Edit ENVI Header>Edit Attribute>Associate DEM file) to associate DEM file with image file, so that whenever you will open image, the DEM will load automatically?

Q: How can I rename the name of an MS image band/channel?

A: Use 'Edit ENVI Header' tool (ENVI > Raster Management > Edit ENVI Header>Edit Attribute>Band Name) and put the new name of the image bands one by one.

Q: I have created a mask layer; can I convert it to classification layer?

A: Use 'Edit ENVI Header' tool (ENVI > Raster Management > Edit ENVI Header>File Type >ENVI Classification) and change the file type to classification.

Q: During post classification how can I recode (i.e. change some pixels values from one class to another within a region of interest only) a class on particular region of interest only?

A: We have to use "Interactive Class Tool" in ENVI classic to recode class during post classification. Open image in ENVI Classic > Classic Viewer>Overlay>Classification> Interactive Class Tool). In the "Interactive Class Tool" > Edit > Mode : Polygon Add to Class. Change the active class (i.e. target class) and draw new polygon with new pixel value to recode any region of interest.

Q: I wanted to create 5 class using SFF classification, but as an output I got 5 numbers of output classified raster layers; how I will get single classified raster layer with 5 classes?

A: Use "Rule Image Classifier Tool" (ENVI > Classification > Post Classification > Rule Classifier). Put proper threshold and classify again.

Q: How to calculate the FLAASH scale factor for Landsat 7 ETM+ image data?

A: FLAASH requires radiance in units of $[\mu W/(cm^2 \cdot sr \cdot nm)]$. In case of Landsat 7 ETM+ image we will get output radiance unit in $[W/(m^2 \cdot sr \cdot \mu m)]$ in ENVI. So we have to convert the unit. These two units differ by a factor of 10. Explanation is given below:

First, separate each component and figure out the difference in units

between the input and output:

W --> μW : factor of 10^6

m2 --> cm^2 : factor of 10^{-4} (negative term because this part is in the denominator)

μm --> nm: factor of 10^{-3} (negative term because this part is in the denominator)

The scale factor is the product of all terms:

scale factor = $10^6 \cdot 10^{-4} \cdot 10^{-3}$, or 10^{-1} .

So, the scale factor in this case is 10^{-1} or 1/10. In the Single scale factor field of the Radiance Scale Factors dialog, enter the denominator value: 10.

Q: How can I resample my image to a higher or lower resolution image?

A: Use "Resize Data" (ENVI > Raster Management > Resize Data). In the Resize Data dialog > Set Output Dims by Pixel

Size>put the new Pixel Size. Save the new resampled output file.

Q. There is some noisy bands in my image and I want to off those bad bands – how to proceed?

A: Use 'Edit ENVI Header' tool (ENVI > Raster Management > Edit ENVI Header>Edit Attribute>Bad Band List>Select the band you want to keep On) to off or on any image band

Q. ENVI installed in 64 bit machine and FLAASH is not working - how can I use FLAASH?

A: Open ENVI in 32 bit mode from your machine and use FLAASH.

Q. I have installed ENVI 5.0 – how can I use ENVI Classic?

A: ENVI classic is installed along with new single window GUI of ENVI 5.0. To use ENVI classic follow: START > All Programs > ENVI 5.0 > Tools > ENVI Classic

Q. I have received license of ENVI 5.0, can I use the same license for ENVI 4.8?

A: Yes ENVI 5.0 license is backward compatible so it can be

applied on ENVI 4.8 also.

Q. How do I know the host id and host name of my machine?

A: Windows OS:

Open a Command Prompt (Start > All Programs > Accessories > Command Prompt) Issue the following commands:

hostname

Getmac

The "hostname" command will return the Host Name for the machine. The "getmac" command will return a list of physical addresses for your machine. You can use any physical address that is listed as the Host ID for the Machine.

Mac OS X:

Open an X11, XQuartz, or Apple Terminal Window

Issue the following commands:

hostname

ifconfig

The "hostname" command will return the Host Name of

Get more Information From Imagery and Data

EXELIS

ENVI – The premier software Solution used to extract information from geospatial imagery

ENVI for ArcGIS Server – Author, publish and distribute image analysis tools to the ArcGIS enterprise

E3De - addresses user needs across industries to quickly and accurately get 3-D products from data.

IDL – The Scientific programming language used to create meaningful visualizations from complex data

Visual Information Solutions



For More Details Contact :

NIIT GIS Ltd. Plot No. 223-224,3rd Floor, Udyog Vihar, Phase -1, Gurgaon, Haryana 122002
Tel: +91 (124) 4002702 Email: ENVI@esriindia.com

the machine. The "ifconfig" command will output a variety of information about the machine. You are interested in the physical address associated with "en0". This may be listed as "ether" or "wifi", depending on your machine configuration.

Linux OS:

Open a Terminal Window

Issue the following commands:

hostname

ifconfig

The "hostname" command will return the Host Name of the machine. The "ifconfig" command will output a variety of information about the machine. For ENVI version 4.8 and IDL 8.0 and up, the hardware address of either "eth0" or "eth1" can be used for the Host ID. For Versions prior to ENVI 4.8 and IDL 8.0, only eth0" can be Used for the Host ID.

Q. Which versions of ENVI and ArcMap are compatible?

A: ENVI 4.8 is compatible with ArcMap 9.3 and 10.0 and ENVI 5.0 is compatible with ArcMap 10.0.

Q. ENVI Tools aren't showing up in ArcMap—how do I install them?

A: If ENVI is installed after ArcMap, these tools should be installed automatically. However, if they are not then you'll need to right click in the ArcToolbox area of ArcMap and select Add Toolbox. Then navigate to the following location and select ENVI Tools.tbx

ENVI 5.0:

C:\Program Files\Exelis\ENVI50\gptools\arctoolbox\toolboxes

ENVI 4.8:

C:\Program Files\ITT\IDL\IDL80\products\envicommon\envigp tools\arctoolbox\toolboxes

Q. Can I access images that I've published on ESRI Image Services?

A: Yes, as of ENVI 5.0 Service Pack 1. These images can be accessed via the Remote Connection Manager and File > Open Remote Dataset.

Q. Can I use .shp file directly to subset an image?

A: Yes, in the new ENVI 5.0 directly we can use .shp file to subset an image

Q. What will happen to my ENVI Ex 4.8 license if I update to ENVI 5.0?

A: ENVI Ex has been renamed as 'ENVI Feature Extraction' and now it is an add module of ENVI 5.0. No separate software media is required for this module. Install ENVI 5.0 and apply the license of ENVI Feature extraction module.

Q. How to perform density slice operation in new single window GUI of ENVI?

A: Density slicing has been termed as Raster Color Slice in ENVI 5.0. To use the same open image in ENVI 5.0 and from

the Layer Manager >Right Click Image >Raster Color Slices

Q. My license file generated for windows but I want to use the same in different operating system – is it possible?

A: Yes it is possible because a typical FLEXlm license file contains structural elements that control which products may run, how many sessions of the product may run, and on which machine the license manager runs. In addition, the number of license units (or tokens) of the FEATURE or INCREMENT lines control the number of copies of the product that may run concurrently. These license units also dictate what operating systems are authorized to run a particular product.

Different types of computers require different numbers of

License Class	Operating System	License Tokens per 1 License Seat
Unix Class	UNIX Systems (i.e. Solaris, AIX, IRIX HP-UX...)	10 tokens
PC Class *	Mac Systems	6 tokens
	Windows Systems	6 tokens
	Linux Systems	6 tokens

Table: IDL License tokens required per IDL user session by operating system

license units to run IDL. The breakdown is as follows:

Q. How can I ensure the software will run on my Linux machine?

A: Exelis software products require a variety of core libraries to run properly. Linux versions of IDL are built on Red Hat 5 to provide as much support to the Linux community as possible. IDL is compatible with, and has been successfully tested with, kernel version 2.6 and gtk2 version 2.10. Many different Linux distributions are available, each with different core library requirements. Please contact your Linux vendor to obtain updates and patches as new library versions become available. This is especially important for 64-bit platforms distributed by open-source vendors, as these vendors tend to release updated versions more frequently without necessarily ensuring backward compatibility.

Q. Can I extract DEM from contour without ENVI DEM add on module?

A: Yes it is possible to extract DEM from contour without any add on module. ENVI DEM add on module is required to extract DEM from stereo images.

Q. ENVI LiDAR module support terrestrial LiDAR/ Satellite born LiDAR data?

A: At this point of time LAS file is supported by ENVI LiDAR. So any LAS data (airborne/ terrestrial/ space borne) are supported in ENVI.

Q. Is it possible to build spectral library using ENVI?

A: Yes, ENVI has 'Spectral Library Builder' (ENVI > Spectral > Spectral Libraries > Spectral Library Builder) using the same Spectral Library can be prepared.

Careers at **esri India**

1. Role: Software Engineer/ Senior Software Engineer/ Analyst

Skill Set

Experience
3 - 8 years

- GIS Development Experience in ESRI Enterprise
- GIS programming in Java
- Expertise in OOAD
- Knowledge on ArcGIS
- Ability to read and generate UML documentation
- Experience in working with XML
- Experience in working with an IDE similar to Eclipse, Netbeans etc.
- Knowledge of Spring framework or similar application development framework
- Demonstrated experience in SOA and Web Services.

Qualification
BE / B. Tech / MCA / M.Sc / M.Tech

Requirement
1 each for respective Location:
Delhi, Bangalore & Mumbai

Desired Skill

- Knowledge and experience with CMMI environment preferred
- Knowledge of GIS technologies
- Java based portlet development

2. Role: Business Manager (Sales)

Skill Set

Experience
5 - 7 years

- Must have exposure to "Government" Sale
- Should be from IT – HW / SW, GIS Industry
- Driving sales targets and should understand the entire sales cycle

Qualification
Graduate

Requirement
1 each for respective Location:
Bhopal, Mumbai & Ranchi

Desired Skill

- Excellent inter-personal skills.
- Go getter attitude
- Excellent communication skills
- Rich experience in client relationship management

3. Role: Regional Sales Manager

Skill Set

Experience
10+ years

- Must have exposure to "Government" Sale
- Should be from IT – HW / SW, GIS Industry
- Driving sales targets and should understand the entire sales cycle

Qualification
Graduate

Requirement
1 each for respective location:
Delhi, Dehradun & Lucknow

Desired Skill

- Excellent inter-personal skills.
- Go getter attitude
- Excellent communication skills
- Rich experience in client relationship management

4. Role: Oracle DBA

Skill Set

Experience
6 - 10 years

- Install, configure, maintain, and troubleshoot Oracle 10/11g
- Install, configure, maintain, and troubleshoot ESRI Software ArcSDE, ArcCatalog etc (version 9x & 10x)
- Install, configure, maintain, and troubleshoot ArcFM
- Apply patches and upgrades for Oracle databases and SDE Geodatabase
- ArcFM and SDE Data modeling
- Database refresh
- Provides troubleshooting support for potential data issues.
- Analyzes the issue to determine the root cause and develop solutions or escalate to the right area.
- Backup/restore
- Install Oracle Client software and troubleshoot connectivity issues.
- Database and Application tuning and performance monitoring.
- Provide Database Technical support to application team
- Monitoring user connections in Oracle and SDE
- Version Management in ArcSDE, Reconcile, Post of Version, Compressing of Geodatabase
- Oracle performance monitoring & performance tuning
- Move test data to development & production environments
- DBA tasks: permissions, jobs
- Maintenance & scripting , SQL & PL/SQL, basic DB Scripting
- Oracle certification is preferable.

Qualification
BE / B. Tech / MCA / M.Sc / M.Tech

Requirement
1 each for respective location:
Bhopal, Mumbai & Ranchi

Desired Skill

- Knowledge and experience with CMMI environment preferred
- Knowledge of GIS technologies

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

Head, Human Resource,
ESRI India

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