

Arc **India** News

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Cover Story

GIS - Inspiring what's next

What's New

Esri India's Innovation Hub enabling what's next in GIS

Product Feature

ArcGIS Maps for sharepoint

Global View

How San Antonio beefed up security for NCAA final four

Technology Update

Drone2Map for ArcGIS 1.3.1



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Agendra Kumar | President, Esri India

Change has always been a constant in our world. But the pace of change has been accelerating exponentially over the past few decades, creating many new challenges. Urbanization promises better living conditions; however, deforestation, climate change, depletion of natural resources like water, and increase in natural disasters force us to think about what is next for our planet.

The global financial losses from earthquakes, hurricanes and wildfires in 2017 amounted to \$306 billion, nearly double the \$188 billion lost in 2016, according to insurance firm Swiss Re. India was fourth amongst the countries that suffered most due to disasters during 2005 - 2014; China, the US and the Philippines being the top three, as per the statistics released by UNISDR.

Many of you are working in organizations that help in preparing for and responding to disasters - from earthquakes to cyclones to landslides and floods. While monitoring disasters as they occur is certainly useful, GIS modeling can help in prediction of disasters. Forewarned is forearmed. KSNDMC in Karnataka has built a very robust rain monitoring system that can provide advance warning of floods. There are also systems that can forecast the occurrence of Tsunami. Such technologies can save thousands of lives.

We live in a very complex and interconnected world. We use geography, the Science of Where, to organize and understand all the interconnections and the processes of evolution and change - both natural and manmade.

What should we do next? We need to work on harnessing the power of digital geography to create a better future. It starts with envisioning what is possible and then accelerating the applications of digital geography in improving efficiency, making cities smarter and sustainable, protecting biodiversity, and integrating environmental thinking into virtually everything we do. It is about applying geography through GIS in this new and expanding world of mapping and location intelligence.

What is GIS today? GIS is moving beyond being a system for managing and analyzing geographic information to solving problems holistically. GIS now has three very powerful components. One is integration: integrating data and integrating people. Second is analytics: the power of computational geography. Finally, the power of mapping and communication. GIS is not only a platform for doing your work better in your organizations but also, in a wider context, in society itself.

Esri India's endeavor has always been to support you in innovating and accelerating the pace of the transformation that you are leading. Our User Conference with the theme "Inspiring What's Next" is providing a platform for deliberations for managing our world better, sharing ideas and learning about new advancements in technology. I look forward to welcoming you at our User Conference!

A handwritten signature in black ink, appearing to read 'Agendra Kumar'. The signature is fluid and cursive, with a long horizontal stroke at the end.

Agendra Kumar

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Esri enters into Memorandum of Understanding with World Bank



Esri has entered into a memorandum of understanding (MOU) with the World Bank, an international organisation with the mission to reduce global poverty. Under the agreement, Esri software geo-enables the World Bank's Survey Solutions software, allowing staff to improve accuracy and quicken the kinds of data collection, analysis, and decision-making that countries need to address the most urgent development challenges.

The organisations will collaborate to deliver solutions that integrate Esri's spatial analytics technology into the World Bank's Survey Solutions and Cloud for Development. Esri's tools will bring real-time data collection and visualisation to these solutions, particularly as they relate to Census 2020.

"The World Bank has an impressive goal: to end extreme poverty and boost shared prosperity," said Linda Peters, Esri global business development manager. "The complex challenges of sustainable development that

the World Bank faces underscore the need for geospatial data and tools for users to understand how to help the most people possible."

The World Bank's Survey Solutions is a computer-assisted personal interviewing (CAPI) software that helps build capacity for data collection and analysis in developing nations. Survey Solutions does this by offering national statistical agencies and other institutions involved in data collection a cost-effective and sustainable solution for conducting surveys. Providing a location component to survey data collection enables field teams to cover populations more efficiently and accurately and begin to put into action a global statistical geospatial framework.

"This agreement with Esri will allow users of Survey Solutions to collect both standard survey data and GIS data," said Michael Lokshin, manager of the Survey Unit, Development Economics, at the World Bank. "Now, our clients in developing countries have a free and powerful platform to collect data in a wide range of surveys. For example, in agricultural surveys, using high-resolution satellite imagery can improve precision and reduce [the] time it takes to measure land plots."

B-Nest and Esri India collaborate to provide GIS platform for the start-up community in Madhya Pradesh

B-Nest, a venture of Bhopal Smart City Development Corporation Limited announced a strategic partnership today with Esri India. This partnership with India's leading Geographic Information System (GIS) software and solutions provider will fuel the growth of GIS focused start-ups from Madhya Pradesh and enable them to innovate new solutions for the complex challenges India is facing and scale them further for global adoption.

The partnership will provide a platform for start-ups incubated by B-Nest to leverage Esri ArcGIS technology. As a part of this initiative, Esri India would provide the start-ups with free access to ArcGIS mapping platform, software development tools and APIs, ready-to-use content and technical mentorship.

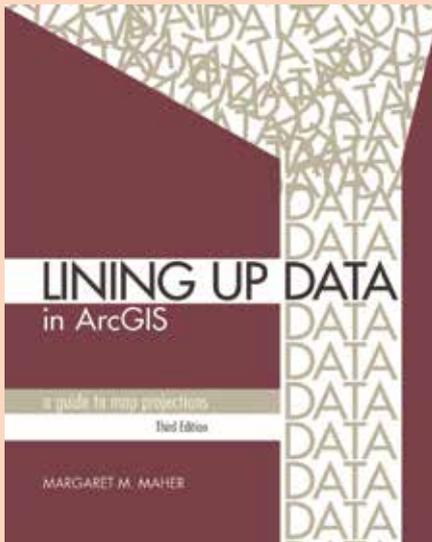
Mr. Sanjay Kumar, Chief Executive Officer, Bhopal Smart City said, "We are very happy to collaborate with Esri India, market leader in GIS technology. Leveraging Esri's globally renowned ArcGIS plat-

form, the start-ups will be able to build robust solutions quickly and scale them to the next level faster. The initiative will also bring investors, customers or seed funds closer to the start-ups and make Bhopal a preferred investment destination for them."

On the occasion, Agendra Kumar, President, Esri India said, "GIS technology already plays a significant role in addressing major challenges such as climate change, sustainability, safety, security and rapid urbanization, which are also the priority areas for our nation. Our partnership with B-Nest will accelerate innovation in the start-up community to develop unique solutions, which address such challenges in an Indian context."

B-Nest provides 24/7 co-working space, access to infrastructure, connectivity, mentorship, business model guidance and investor access to the start-ups which will help them grow faster. Start-ups who present a strong business plan can have the opportunity to participate in Esri's three-year global Start Up program that gives emerging businesses the tools to build mapping and analytic capabilities into their products.

Lining Up Data in ArcGIS: A Guide to Map Projections, Third Edition



Complete with full-color maps and diagrams, *Lining Up Data in ArcGIS: A Guide to Map Projections, Third Edition* presents techniques to identify data projections and create custom projections to align data.

The book's author is Margaret M. Maher, who has resolved more than 16,000 cases pertaining to issues associated with map projections and data conversions during her 18-year career in support services at Esri. Besides covering the basics of how to work with coordinate systems and map projections, Maher addresses some of the most common issues that cause mapmakers confusion. Readers will learn, for example, how to:

- Identify correct geographic coordinate systems.
- Identify vertical datums and

perform vertical datum transformations.

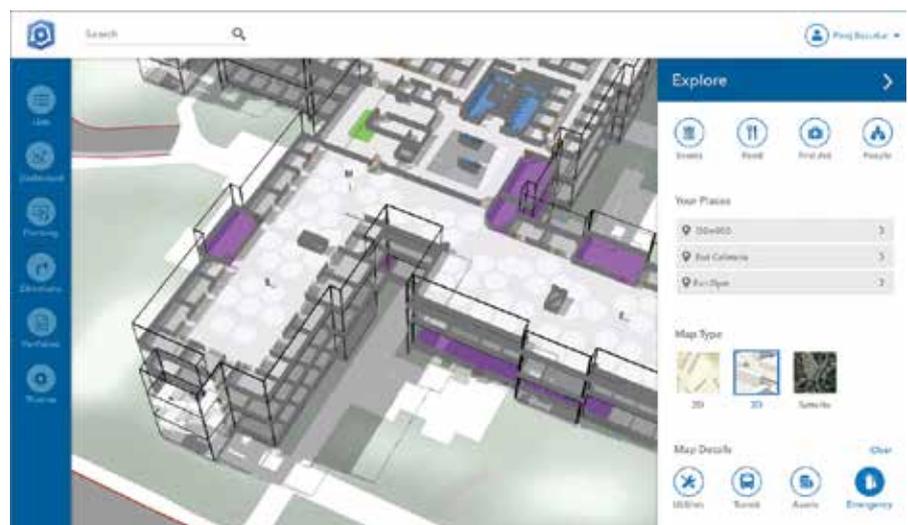
- Add x,y data to maps.
- Resolve alignment problems reflected in common error messages and warnings.
- Figure out which map projection to use for a project.

The book's third edition includes a new chapter on working with vertical coordinate systems, a topic that's critical to scientists and researchers studying climate change and rising sea levels.

Lining Up Data in ArcGIS: A Guide to Map Projections Third Edition, is available in print (ISBN: 9781589485204, 272 pages, US\$39.99) and as an e-book (ISBN: 9781589485235, 272 pages, US\$39.99).

Esri announces new indoor mapping product

Esri has announced that it will release ArcGIS Indoors, which will enable interactive indoor mapping of corporate facilities, retail and commercial locations, airports, hospitals, event venues, universities, and more. ArcGIS Indoors uses data streams, real-time processing, and location intelligence tools to help businesses and other organisations understand how to better coordinate space and other resources with their facilities and campuses. Insights from sensor networks will deliver real-time information to managers and executives through interactive dashboards, while visitors and employees can find useful information about the buildings they occupy. Floor-aware, 3D maps will allow building operators and occupants to quickly access and explore critical business information, like the location and status of fire



Esri announces it will release new indoor mapping product, ArcGIS Indoors.

extinguishers and their last inspection dates, or conference rooms and their projector options.

"ArcGIS Indoors brings the interior building space into the future by placing data about employees, schedules, meetings, customers, and events into a geographic context," said Nitin Bajaj, Product Manager, Esri. "Having

spatial awareness gives executives, managers, and employees better insight so they can operate more efficiently and competitively."

ArcGIS Indoors will be available for widespread use by the end of the year. However, a beta version of the product has been released at this year's Esri User Conference.

Esri India recognized as the "Best Company to work for" by Silicon India

Esri India is proud to bag a place in the list of 'The best companies to work for,' published by *The Silicon India Magazine* in its special June 2018 edition. Esri India has been a perfect example of a company whose guidelines are channelized towards making employees happy. "Happiness is our thread of unity that binds all Esri'tes. Being happy at our organisation extends to all facets – mental-physical, heard-spoken and felt-seen," avers Agendra Kumar, President, Esri India Technologies. The company brings on board passionate professionals who desire to embark on the happy journey of expanding own along with GIS technological frontiers. The year-round recruitment process ensures that no fresh intelligent mind is left behind during campus hiring. Its healthy mix of juniors and seniors empowers young talents to aspire and learn best practices from their leaders. Alongside, Esri India ensures an unbiased format of promotions and appraisals as well.

"Our open culture, flat management structure and innovative HR practices have made us the 'Most Preferred GIS Company to Work for' and 'Preferred Employer of Choice,' as rated by GIS Development," asserts Agendra.

Esri and University of Redlands partner to shape future 'Spatial Transformers'



The global use of geographic information systems/location intelligence is expected to double by 2023, becoming a \$10-billion industry. To maximise the understanding and effectiveness of this technology in the private sector, the University of Redlands School of Business has partnered with Esri, the global leader in location intelligence, to launch the Spatial Business Initiative.

The Spatial Business Initiative will entail innovative educational programmes, ground-breaking research, and national

and international advisory offerings with the purpose of enabling businesses to realize the value of location intelligence and to create leaders who can use this intelligence to transform their businesses.

Funded through a grant from Esri, the Spatial Business Initiative will offer a one-of-a-kind online MBA with a concentration in location analytics starting in September 2018. Following close behind will be the launch of the formal certificate in location analytics in January 2019, offered both online and on the University of Redlands main campus.

In addition, the Spatial Business Initiative is surveying businesses across diverse industries to better understand how businesses use location intelligence, including strategies, costs, benefits, risks, challenges, and trends. Results of the first survey was reported at the Business Summit during the July 2018 Esri User Conference in San Diego.

Other projects include an annual research conference; executive training; and an Esri Press book entitled *Spatial Business: Competing and Leading with Location Intelligence*.

Esri & Waze deliver real-time data for smarter cities

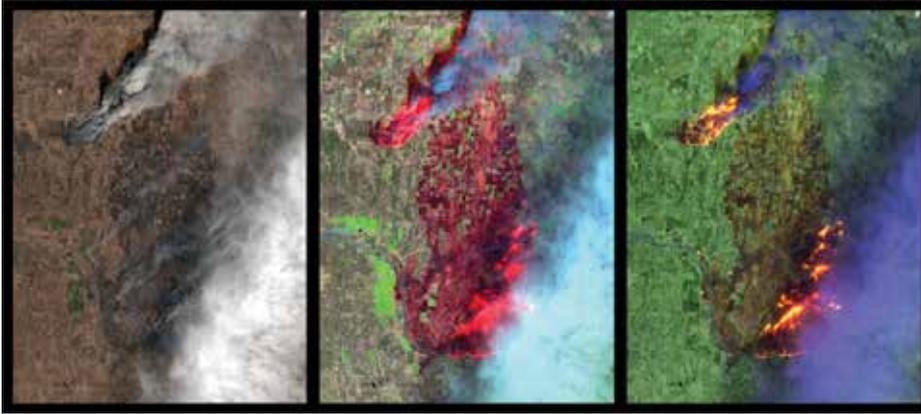
Waze live alert data will now be available in Esri's ArcGIS Marketplace for free to members of the Waze Connected Citizens Program. The Connected Citizens Program, a two-way sharing of publicly available traffic and road condition information, offers governments a stream of data, constantly updated in real-time, whenever they need it.

"Municipalities can now leverage near up-to-the-minute reports without having to write code or purchase additional software," said Andrew Stauffer, Manager, Civic Technology, Esri. "Mapped Waze data is available immediately in all ArcGIS apps, where

traffic engineers and even city planners can use it to maintain and build safer, more efficient transportation systems."

"The Waze Connected Citizens Program is all about removing any barriers to innovation," said Adam Fried, Global Partnerships Manager, Waze. "We want to help our partners leverage existing infrastructure and be able to make better data-driven decisions. Now, with just a couple of clicks, a city can easily access and analyze Waze data within Esri ArcGIS and use those insights to improve roadway management and build safer roads for its citizens."

Esri announces release of Sentinel-2 Image Services



Multispectral Imagery

Esri has announced that it is releasing Sentinel-2 Image Services to all Esri users for no additional cost. Sentinel-2 is an earth observation satellite that provides multi-spectral imagery for any location in the world at 10-meter resolution. Currently, in beta, the service is updated daily with new imagery for all ground locations every 5 to 7 days.

Esri makes the multi-spectral data quickly accessible using ArcGIS Image

Server and publishes an image service through the ArcGIS Living Atlas of the World (Living Atlas), hosted on the Amazon Web Services Infrastructure. The service includes all Sentinel-2 imagery going back 14 months, enabling change to be easily reviewed. Image analysis can be run directly on the service to create indexes displaying properties such as vegetation health or soil moisture as well as quantifying the changes over time, for a better understanding of the environment.

Esri developing ArcGIS Urban to help cities orchestrate real estate development

Esri is developing ArcGIS Urban, a solution to give urban planners and designers engaged in government, real estate, and engineering projects, better city information so that they know the best places to build and develop. ArcGIS Urban will visualise zoning codes, track project life cycles, and measure the impact of projects after completion. This all-in-one system will be accessible to the professionals who plan and build cities, whether for a city planning department or a real estate development company.

The challenges faced by some of the fastest-growing US cities are due largely to a disconnect between developers' project designs and the regulatory codes defining what can be built and where. In many cities, zoning code text is outdated,

cumbersome, and confusing. The difficulty in interpreting and understanding it slows governments, stalls developers, and delays the ability of cities to meet citizens' needs. ArcGIS Urban will help interpret these codes and make them readily available through an interactive online portal, adding efficiency to planning activities throughout the city.

"One of the most urgent concerns for cities today is ensuring a supply of new housing to meet the demands of growing populations," said Brooks Patrick, Account Executive, Esri. "ArcGIS Urban will offer planners and designers a common environment for sharing what is being planned and what is being built, allowing them to discuss and resolve problems around housing, transportation, and economic activity efficiently."

NGA selects Esri for geospatial technology contract

The National Geospatial-Intelligence Agency (NGA) has signed a multi-year technology contract to deploy Esri's ArcGIS platform throughout the organisation. The NGA will use ArcGIS to continue the organisation's mission of providing geospatial intelligence (GEOINT) to users around the world including US policy makers, the armed forces, intelligence agencies, and first responders. One way Esri technology will help throughout the NGA will be to maintain data in a common format so that it can be easily understood and acted on quickly.

GEOINT services allow users to employ NGA data to support activities such as intelligence analysis; operational planning, modeling, and simulation; command and control; and joint intelligence operations. The ArcGIS platform is the backbone for providing analytics; enabling collaboration; and sharing worldwide geospatial datasets, including analytical content, foundation features, elevation, and the precise point positioning that is used throughout the defense and intelligence communities.

"We are honored that NGA has selected Esri for this new contract," said Jack Dangermond, Founder and President, Esri. "NGA is a valued partner to us, and we will continue to support NGA's mission to provide access to cutting-edge geospatial technology to the greatest number of users in the intelligence community and the Department of Defense."

Flourishing forests with GIS

What all comes under the purview of Forest Management?

The basic objective of forest management is to monitor the cover and the density of the 94,000 square kilometre of forest area in Madhya Pradesh. Overall management of a forest includes classifying it into density types; dense, medium dense, open forest and shrub. Shrub is the open land where there is no tree. The Madhya Pradesh Forest department is aspiring to convert the forests from one density type to the other, for example, if there is an open forest, then we envision it to become a medium dense forest, and from there we want it to be a dense forest.

GIS also helps in monitoring production of forest produce such as timber, fuel, minor forest produce, medicinal plants etc. We also need to keep track of the wildlife and the health of their habitat. To achieve these objectives we follow different management practice, which help in curbing negative influences on the forest areas.

What are the principles followed for the management of Forest?

Forest management is enshrined in what we call as the working plan code. The working plan code has been promulgated by the Government of India. The code has laid out principles by which the management rules are laid out based on the quality and type of forest. The code is a very comprehensive document which allows us to make a working plan. A working plan is a ten year comprehensive plan for management of forest.

How is GIS facilitating the management?

We manage a very large landscape of the State and it becomes difficult to manage such an area using paper

maps, with GIS, the complex management becomes easier. We are able to add layers, attributes such as point, line and polygon data, manage historical data, do image analysis and much more, which is not possible on, paper maps.

How is Esri India enabling you?

We have been using the Esri platform for forest management since 2008. Open source alternatives are available but the support that comes with the proprietary software is more robust especially when it comes from the leader in GIS technology-Esri. The support provided by Esri India helps us to overcome bottlenecks. Additionally, if we require any changes/customization in the software and Apps, Esri India team extends excellent and timely support.



Interview with Anurag Srivastava, Addl. DCP, Forest Department, Government of Madhya Pradesh

Currently what are the areas in which this platform is helping?

Esri ArcGIS Online is significantly helping us in monitoring and taking corrective actions faster. Using the portal, we can interact with the field staff, take their feedbacks & inputs, collate that and take a comprehensive decision. Forest is a dynamic ecology, there are many things happening all around. All the feeds that come in, for example, a tiger or a leopard is moving in urban area or some cover loss happening; we are adding to cover by doing plantation and we want to monitor all that dynamically straight from the field, and this data is of great help for forest management. Esri India team helps in achieving this objective.

How do you think the system can be enhanced?

It would be better if the response time for support and changes/customization to software can be reduced. The amount of time it takes to actually handle a request should be minimized. This is what we expect from the platform in near future.

Esri India's Innovation Hub

Enabling what's next in GIS

The team at Innovation Hub works closely with Esri India Partner Ecosystem and helps them develop their solutions in a real-world scenario

Innovation is the key to success and Esri India has once again proved the point through its newly launched Innovation Hub.

"We believe in constant innovation and believe that whatever new we have, we should be able to put before our customers. This is the thought behind the Esri India Innovation Hub", shares Agendra Kumar, President, Esri India on the launch of the Esri India Innovation Hub, which is located in Noida, Uttar Pradesh.

Exuberating energy and enthusiasm from its every core, the Innovation Hub is set up with the objective of bringing in synergies among research & development and advanced technologies such as Sensor Monitoring, Big Data, and IoT. The hub also enables Esri India to work closely with its customers. It enables it to better understand their requirements and develop and deliver more effective solutions for their businesses.

GIS is an enabling technology, be it forest management, water management or utility management, GIS has a pivotal role to play in almost every sphere of life. From paper-based maps, we have moved to digital mapping and now it is the era of GIS.

Agendra gives the gist at the launch by saying, "The change which is happening today is that whenever data is created it gets integrated into a GIS system such that effective analysis can be done using visualization. With continuous technological advancements taking place, GIS must



Esri India Innovation Hub

get integrated into the world of AI and IoT, and this is what the Innovation Hub aims to achieve."

The goal of the Esri India Innovation Hub is to ensure that whatever new technology is coming up, it gets integrated into GIS and present this to customers so that they can build more robust systems. The team at Innovation Hub works closely with Esri India Partner Ecosystem and helps them develop their solutions in a real-world scenario. The hub is also equipped to provide an infrastructure of open data gateway along with Esri Managed Cloud Services (EMCS) division for its customers to access and use the localized content.

GIS and Smart Cities

India's Smart Cities Mission and AMRUT schemes are perfect platforms to showcase how GIS is necessary for achieving urban transformation. A smart city is incomplete without GIS and this got highlighted all the more through the use cases shared at the launch event. While showcasing the various innovations made by Esri India that

are making GIS an integral part of a smart city functioning, the event focused on Smart Map Bhopal, Bhubaneswar One and GIS for Smart Utilities. The solutions helped to understand how GIS provides an integrated platform to access and analyse vast datasets along with tools for the preparation of Masterplans in an efficient way. This helps in more efficient town planning.

Leveraging IoT for air quality monitoring

Air quality monitoring has become an important part of healthy living and GIS can play a very important role here as well. This is another area where Esri India has made appreciable progress as it stands ready with an application that leverages sensors and IoT for air quality monitoring, analytics, and planning. The system accurately predicts the PM levels in varied areas within the Delhi city. It can also tell you which areas are the most hazardous or most dangerous for everyone, more specifically for asthma patients. This analysis can help the field officers to take corrective action on time to improve the air quality. Citizen engagement is also an important part of this application. Using mobile apps the citizens can also make the authorities aware which areas need immediate attention.

app, the current air quality index alert on the current location and into geo-fence area.

Ensuring safe cities towards citizens safety

While safety remains a concern on everyday basis, it becomes a bigger issue in case of a public event. Using integrated GIS platform, information about resources can be easily accessed and planned. Using situational awareness, they can be deployed most effectively to achieve maximum surveillance and security. At the Innovation Hub launch event, Esri India demonstrated how one of its solutions can aid in visualising 3D model of a city, identify the placement of resources in case of an event and ensure complete safety of its citizens.

Smart solid waste management

GIS and IoT can be integrated to detect the status of dustbins in a city and workflows can be automated for collection in an optimised way. Triggers can get generated when the bins are about to get filled up using sensors and field officers can be alerted to empty them quickly. This kind of innovative solutions makes it easier for cities to remain clean at all times. Using GIS optimal routes for garbage collection can also be chalked out.

GIS has huge potential in making lives for citizens easier by facilitating better coordination between the authorities and the citizens and the Innovation Hub launch presented just a few examples, where Esri India is taking the lead in conceptualising such solutions using its ArcGIS platform.

Esri India has also been playing an important role in enabling start-ups in the geospatial domain to gain momentum, to excel in their field of specialisation and the Innovation Hub is another of its initiative to facilitate the development of innovative citizen-centric solutions using GIS.

“It is the perfect step to integrate various technologies and understand how we can develop solutions for solving real-life problems; the idea is to make departments work together, make things collaborative”, Vijay Kumar, Head of Technology, Esri India reinforces. ◆



Showcasing Innovations @ Innovation Hub

The integrated GIS & IoT based system can be leveraged for:

- Identification of air pollution source.
- Air pollution hot spot identification.
- Managing air quality information.
- Addressing ambient air pollution of particular location.
- Understanding how vehicular air pollution affects human health
- Displaying on the location intelligence citizen

Information Technology is growing rapidly and with that the GIS platform is also getting bigger and bigger. With the ever-increasing complexity of information technology, implementations of Enterprise GIS across the organisation are also getting complex. GIS Managers are getting asked about return on the investment made on GIS and the results are expected in shorter time. Some of the requirements are agile in nature and organisations are reluctant to hire a highly skilled employee for completing a one-time task. Esri India Professional Services are designed to specifically address these customer needs with customer success as the highest priority. Service packages are designed not only to support ArcGIS Platform implementation but also to ensure business continuity through knowledge transfer and best practices advice to organisations during the services engagement period. These services are provided by best in class consultants with variety of skills including ArcGIS Enterprise architects, database architects, application architects, security experts, cloud experts, capacity and sizing experts, technical advisors, senior product trainers, senior data and application specialists.



Maximising Return on Your GIS Investment with Esri India Professional Services

Esri India Professional Services are available in two categories:

- Professional Service Packages as per project life cycle stages
- Enterprise level engagement

Professional Service Packages to support your project lifecycle stages

Professional Service Packages that are short term and high impact are offered to customers in order to enable them to jumpstart the usage of the ArcGIS Platform. The users can select packages based on

their specific needs in the organisation from initial GIS strategy and planning stages to production and operations stages. While complex implementations take longer to use the platform, these Service and JumpStart Packages enable users to start using the platform within a few weeks. Service Packages are standardized service offerings with a defined scope and fixed price.

Globally, the most popular packages of Esri Professional Services are Web GIS JumpStart kit and GIS Architecture Design.

Currently, the following Professional Service Packages are being offered

GIS Strategy and Planning

- organisational GIS Needs Assessment and Roadmap (12 Days)
- Smart City GIS Roadmap (10 Days)

Enterprise Design and Analysis

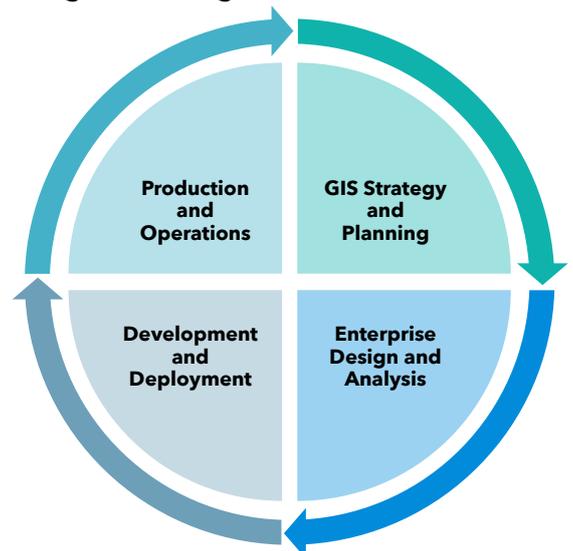
- GIS System Architecture Design and Capacity Planning (10 Days)

Development and Deployment

- Portal for ArcGIS JumpStart – Web GIS Launch Kit (12 days)
- ArcGIS GeoAnalytics Server JumpStart (10 Days)
- ArcGIS GeoEvent Server JumpStart (10 Days)
- ArcGIS Image Server JumpStart (10 Days)
- ArcGIS Insights JumpStart (10 Days)
- ArcGIS Online (AGOL) JumpStart – Web GIS Launch Kit (7 days)

Production and Operations

- ArcGIS Enterprise Upgrade package (12 Days)
- ArcGIS Monitor JumpStart (7 Days)



Short-term Business or Technical Consulting engagements

While the Service Packages provide fixed product oriented offer, the focused consulting services, business or technical consulting, allow short-term engagement of Esri India consultants, having expertise in a number of consulting days per calendar year. The consulting days do not have to be consecutive days. The high-level strategic and/or specialist advice would normally be short term. Consulting services might involve consultants that assist with implementing and advising on operationalising of projects and programs. The intellectual services rendered by consultants vary greatly from one project to the other.

Enterprise Level engagement

The Enterprise Advantage Program (EAP) is a bundle of various components of professional services and other services offerings into one flexible subscription Enterprise Level contract. When you join the Esri Enterprise Advantage Program, you experience ongoing engagement throughout the year. Globally more than 600 organisations are signed up in the Enterprise Advantage Program.

Following are the components of EAP:

Core Components:

- **Assigned Strategic Technical Advisor** - Focused on your enterprise GIS needs.
 - **Annual Account Planning Session** - With your organisation's key stakeholders and senior Esri India representatives to define or update your high-level annual EAP work program.
 - **Technical Work Plan** - Acting as a road map to drive collaboration and technical enablement, this document outlines

the customer's GIS vision, goals, and objectives and the recommended activities.

- **Quarterly Technology Webcasts** Esri technical specialists or product managers will deliver relevant technology topics related to the Esri platform and enterprise GIS in these exclusive Webcasts.
- **Services** - A flexible spending program that allows Learning and Services to be substituted for strategic professional services, application support, and GIS training.

Optional Components:

- **Premium Support Services** - Esri Premium Support customers have access to all of the support offerings provided under a standard support contract, and in addition, they receive a number of additional benefits including Assigned Technical Specialist, 24x7x365 Support, Prioritized Case Management and Proactive updates.
- **Esri Global Expert Visit** - Global expert on chosen industry domain or technology visit can be planned for working on complex scenarios and bringing global best practices.

Learning Services: Instructor led trainings enable your team to master essential concepts, ArcGIS best practices, and recommended workflows in classes created and taught by Esri India subject matter experts and in return increase productivity of your staff. Esri India Capacity Building Programs advice on training recommendations for individuals, training plan for project and department, and workforce development plan for enterprises.

How does EAP work?

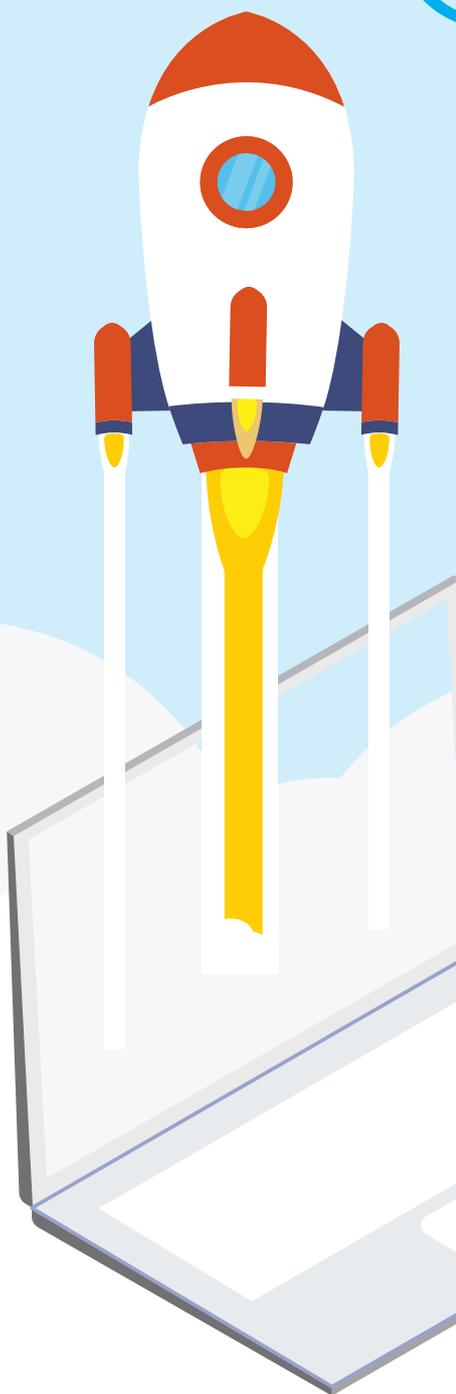
Customers that are part of EAP are assigned an Esri India technical adviser (TA) to work with them

throughout the course of their annual engagement. The TA is an Esri India's GIS expert who gets to know the technical and business needs of customers and helps craft or support a location strategy. A location strategy is a plan for how location or geography can add value to and improve an organisation's business processes, workflows, and outputs. It is the link between a business plan and a GIS-focused technical strategy. Part of the TA role is to help users see their potential and expose them to new ideas and concepts as well as evolving workflows and standards in the industry. The TA works with the customer to develop a technical work plan that will serve as a road map for how to proceed throughout the year and beyond. The technical work plan captures the customer's overarching mission and vision for GIS and itemises a series of activity recommendations tailored to help users meet the needs pointed out by their GIS vision. These can be technical or business needs, depending on the users and where they are in their plan. The TA primarily works with an organisational champion to drive incremental success, paving the way to a more robust engagement, proactive and ongoing.

This takes shape through collaborative work like conference calls, emails, formal meetings, and monthly status reports. The regular cadence of advisory communication enable the organisation get ahead of potential issues and paves the way for key initiatives. Due to the immense contribution of the EAP program to the organisation, most customers stay in the program year after year, maintaining a strong, collaborative relationship for the long term.

To learn more contact your Esri India Account Manager or mail to sales@esriindia.com or ps@esriindia.com

START-UPS & GIS GOING HAND IN HAND



The start-up ecosystem all around the world is growing by leaps and bounds, and India is no exception. The trend is driven by factors such as evolving technology, massive funding, consolidation activities and a burgeoning domestic market. Another reason for the uptick in the trend is that the young generation today is more eager to test their entrepreneur skills at an early age. They are ready to take risks and even the support system is evolving to make the dreams come true.

Extending support to start-ups

Both the private and public sectors are coming up as strong partners in the start-up story. The Esri Start-up Program is a global, free, three year program that gives emerging start-ups the tools to build mapping and location analytics capabilities into their products. Qualifying start-ups receive Esri's ArcGIS online services, software, training and support to jump-start product development, content, and other opportunities to help them succeed. The program includes opportunities for co-marketing and networking

with industry experts. Globally, the program supports more than 400 start-ups in the areas of agriculture, urban, transportation, utilities, IoT, retail, disaster management etc.

To provide a more enabling environment for start-ups, last year, Esri India organised Geolnnovation- A Challenge for Startupreneurs in partnership with Department of Science and Technology (DST). This was GIS industry's first of its kind Public Private Partnership (PPP) initiative in India. The Challenge empowered start-ups to bring their GIS based business ideas to market, build a strong network with industry experts, investors and peer group. Most importantly, the program provided selected start-ups a platform to pitch their software products to Esri's global customers. It was an excellent opportunity for start-ups to showcase their talent and get acknowledged among the leaders of the industry. As Bhaskar Pilla of Saartha Labs, one of the winners of the Challenge shares, "It was a very rewarding experience both for us and our customers. By the virtue of winning the competition, we were asked to present in the key note session for five minutes, after which people from premier firms like Reliance JIO and Adani Group congratulated us and asked for more details. A lot of people started approaching us which wouldn't have happened

suddenly without participating and winning the competition.”

While talking about his experience at GeolInnovation, Soubhagya Sahoo of Grayroutes Technology says, “First of all, we got a chance to present to an elite panel of judges. They actually believed in our solution to mark us as a winner, which gave us a lot of credibility. It also gave us a lot of visibility in front of our clients. When an established market leader recognizes the value additions from an innovative product, the innovation gains industry credibility, which is precisely what, has happened with us.”

Keeping in view the benefits the Challenge has offered to the start-ups, we can confidently say that India needs many more such initiatives. According to Shiva Dhawan of Attentive AI, “Such opportunities are very important, because start-ups need motivation, push and access to the right people who understand the technology and without these events it’s very hard to do all of that. It gives a showcase to the right audience of what we are doing and only someone like Esri can do that.”

GIS in the changing scenario

Location has become an integral part of the business world today, providing the powerful “where” perspective to businesses. With more and more innovations happening in its realm, location technology is becoming the key differentiator to businesses to improve customer experience, drive revenue and increase operational efficiency. Technologies like the Internet of Things (IoT), autonomous vehicles and sensors are capturing information that has never been captured before, creating entirely new avenues for geospatial data collection. As a result, location-based analytics and platforms that can process and detect trends and provide intelligence are becoming more popular.

Accordingly, the role of GIS in businesses is gaining momentum with every passing day.

Understanding the potential of GIS, a large number of start-ups are focusing on developing products or applications that could help businesses harness the potential of GIS for more informed decisions and better outcomes. Setting a good example in this realm is Saarth Labs, which has built this product called Business on Maps which is a B2B application which helps organisations get value out of their location within the SAP landscape.

Another start-up which is enabling businesses gather intelligence by analysing drone and satellite imagery is Attentive AI. The artificial intelligence tool, developed by Attentive AI is hosted on ArcGIS, and it extracts information from imagery on a GIS map through python script.

Agnext Technologies, a start-up in agricultural sensing and solutions firm uses GIS to calculate the acreage of a particular farm field. The system also helps to understand soil pattern of the field. These kinds of analysis are very crucial for insurance companies when it comes to farm loans. Based on GIS and remote sensing, the insurance companies are able to know which particular piece of land is cultivated through which farm, whether it is personally owned or on lease, etc.

The start-up, Gray Routes Technology is a leading provider of location analytics and field automation software. The company provides geospatial data and affordable tools for territory and inventory planning, serving businesses across sectors by organizing consumer demand, streamlining order aggregation and providing marketing analytics.

These are just a few instances where by leveraging GIS, the start-ups are



weaving new success stories; the list is getting longer every day.

An exciting future ahead

With continuous technological advancements taking place, in the future, GIS will involve much more real-time situation monitoring and assessment and will need new kinds of tools that can effectively treat information, which is continuously changing. Innovative start-ups will not only embrace latest technologies like AI and IoT in their operations, but will also largely engage into developing products that will house the capabilities of these technologies to provide the users, the maximum advantage of location. With new ideas in their basket, the startpreneurs would definitely need handholding and this is where leaders like Esri will keep on playing a vital role. The collaboration of experience and young talent will bring in excellent growth opportunities, which when harnessed will make the country a strong entity in the global GIS map.◆

Geospatial Technology Empowering BFSI Industry in India

The BFSI sector in India forms one of the core industries responsible for the financial health of the nation. Expansion and progress of the same is crucial for our economy. It has been ahead of the curve, when it comes to technology adoption. To combat the challenges related to non-performing assets and delinquency, the sector is rapidly adopting geospatial technology.

Esri India with its ArcGIS solution has not only partnered with Bajaj Finserv to adopt best in class geospatial technology, but also helped in enabling the bank to expand its footprint and serve its customers better.

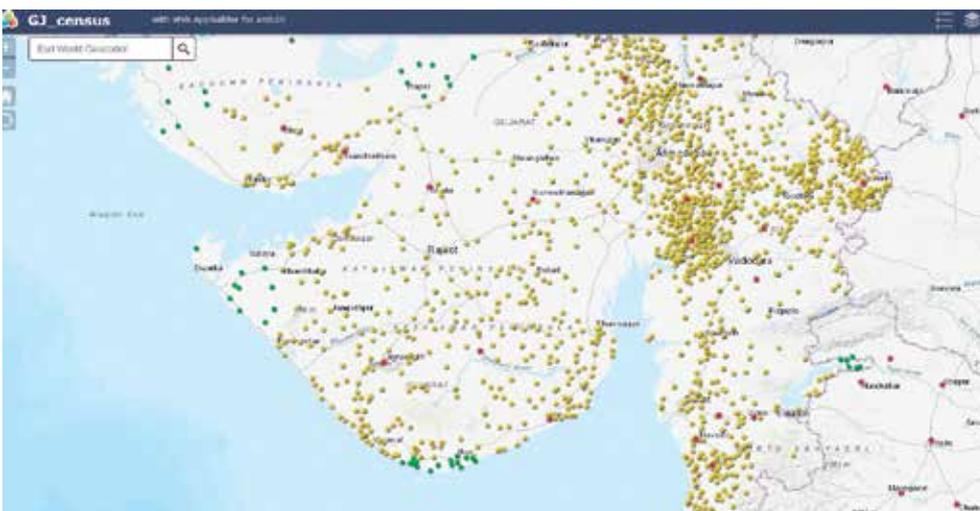
Challenges

In India, most financial organisations are burdened by high NPAs (Non-performing assets) and delinquency. Bajaj Finserv

was no exception to this, and was looking for better ways to reduce delinquency. Without a geospatial capability, they were unable to look at risk locations in a granular way, leading to several challenges in identifying potentially delinquent customers. Another challenge was to understand potential areas of growth. Cross-sell was identified as a key area for growth and geospatial targeting would help improving conversions.

Solution

While it is important to identify new avenues for product sales, it is equally important to leverage the existing customer database for create cross-selling and upselling opportunities. With the objective of focussing on these opportunities with existing customers, the current database from the CRM system was integrated with Esri's ArcGIS platform thereby enabling the following:



Gujrat Prospect List



Client Speak

The Esri GIS solution has managed to geocode all the records in our entire customer address database successfully along with certain accuracy. This has helped to map negative area and OGL where we as a company don't want to reach because of negative profile of customers. Its visual insights based on geocoding has helped us well in taking strategic decision for branch expansion work.

Nilotpal Gupta

Head of Business Intelligence and Analytics Infrastructure, Bajaj Finserv

- Defining areas based on risk propensity (e.g. negative areas based on historical data available).
- Greater collaboration by sharing information on areas with high risk propensity and customer profile data across departments.
- For any product request, out of geo-limit customers (OGL) could be identified in real time during customer on-boarding.

The solution was installed in October, 2016 by Geospec, an Esri India Business Partner organisation. It comprised of the following two critical components:

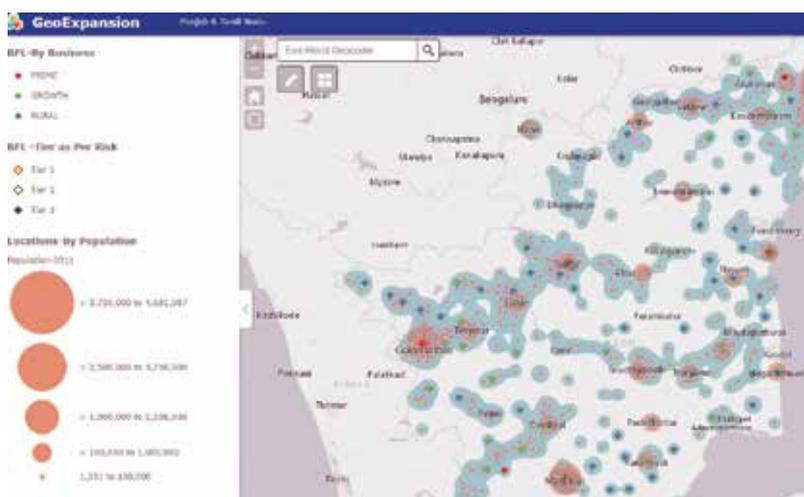
- Loqate - an application developed for cleansing the customer addresses and geocode them.
- Esri ArcGIS Desktop along with ArcGIS Enterprise as the platform to create maps, dashboards and map based applications.

Benefits

Such a solution has large potential for the BFSI sector as it can be easily implemented for any bank, insurance and financial institution. Institutions can leverage their existing database to improve their customer service.

The solution from Esri has benefited Bajaj Finserv significantly:

- It has helped in lowering of delinquency within the customer base for the cross-sell business.
- It has allowed for real-time integration enabling Bajaj to filter bad customers out of their system right at the entry level.
- It has improved field allocation of agents for better productivity.
- It has allowed the business to offer proximity based products by utilizing the geospatial platform.

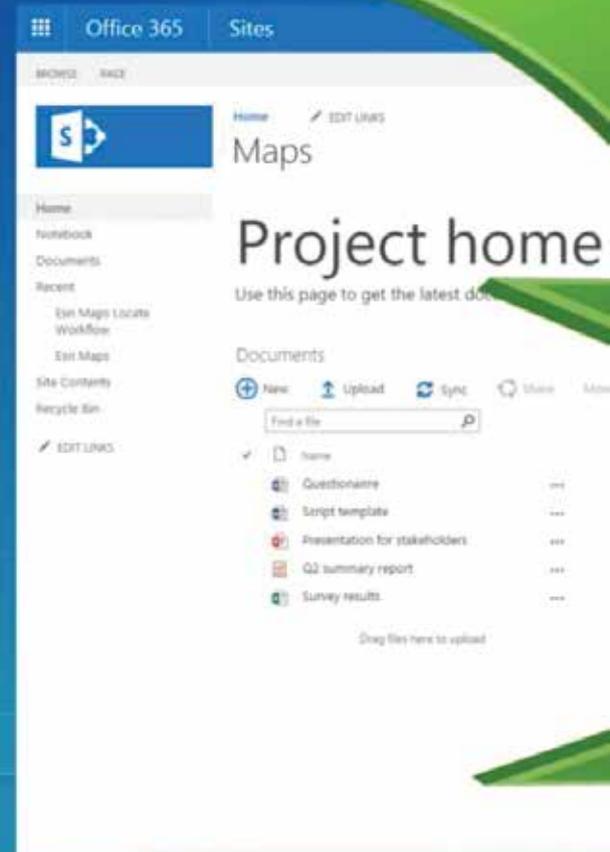


Branch Expansion planning

ArcGIS content



Your geoenabled
SharePoint content



ArcGIS Maps for SharePoint

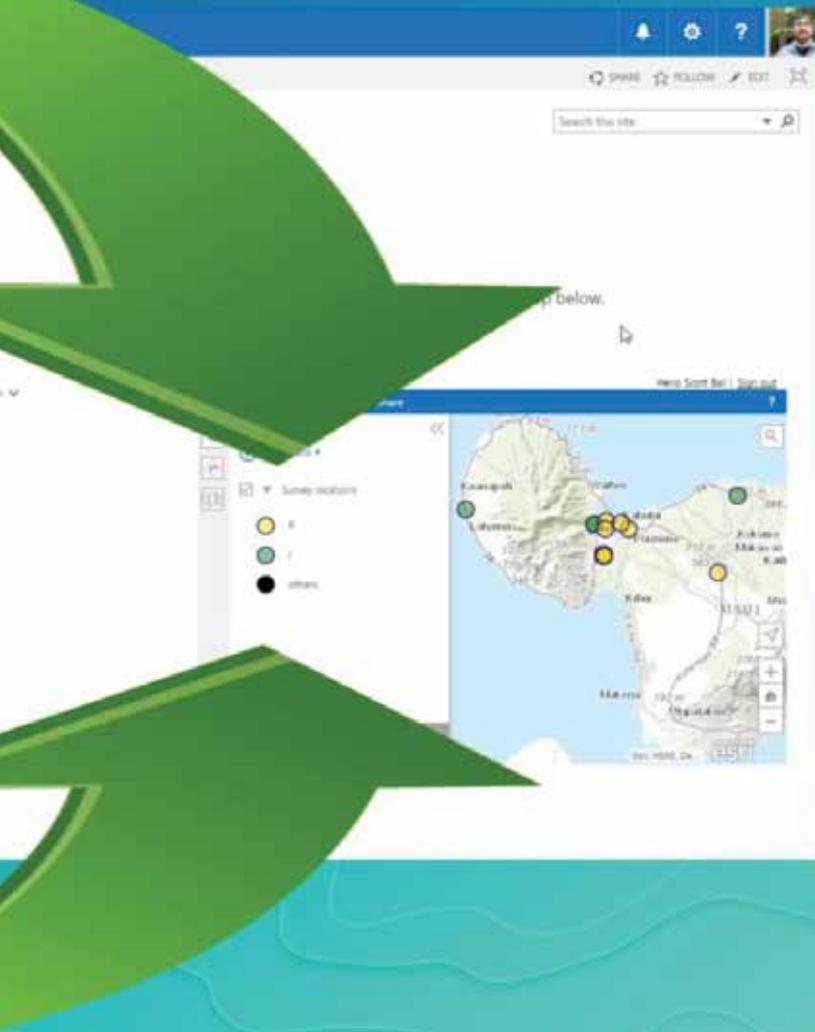
With ArcGIS Maps for SharePoint, the user can create maps that combine the SharePoint data with published geographic content from ArcGIS.

ArcGIS Maps for SharePoint leverages the Microsoft SharePoint framework to offer interactive and configurable mapping components that gives the user a geospatial view of their organisation's data. With ArcGIS Maps for SharePoint, the user can create maps that combine the SharePoint data with published geographic content from ArcGIS.

The user can also share the maps created in ArcGIS Maps for SharePoint with others in and outside of the organisation using ArcGIS.

The ArcGIS Map Search app part included with ArcGIS Maps for SharePoint allows the users to tag all their SharePoint documents using location information by dragging documents or document libraries onto a map. After the appropriate

Your SharePoint site page



tags have been generated, one can view the documents associated with that location by clicking on the map.

Once ArcGIS Maps for SharePoint is installed and configured, the users have access to the following three components that help them to map and organize SharePoint and ArcGIS data.

ArcGIS Maps Locate workflow

SharePoint lists containing address data must be geocoded or spatially enabled before that data can be added to the map. Geocoding is the process of taking data, such as an address, and converting it to a coordinate that corresponds to a location in a coordinate system. Using the ArcGIS Maps Locate workflow, one can geocode lists containing addresses, US cities, US states, US ZIP Codes, world cities, and countries.

The ArcGIS Maps Locate workflow reads specified information from the SharePoint list and generates a new list column containing location information that can be used to plot features on a map.

ArcGIS Maps web part

The ArcGIS Maps web part is the JavaScript-based web part for ArcGIS Maps for SharePoint. It allows the user to display SharePoint lists, ArcGIS-hosted feature services, and ArcGIS web maps on an interactive map.

With the ArcGIS Maps web part, the user can do the following:

- Add interactive maps to the SharePoint pages.
- Add location-based lists or ArcGIS content to the maps.
- Add context and precision to the location-based lists with Esri demographic data.
- Share maps and layers on ArcGIS for the public or the organisation.
- Connect to List and Chart web part using web part connections.

ArcGIS Map Search app part

The ArcGIS Map Search app part allows the user to quickly locate documents stored in the SharePoint site collection using location attributes.

The steps involved are:

1. Add one or more reference layers to the map in ArcGIS Map Search.
2. Drag documents onto the map to automatically tag them using geographic information.
3. After the tags are generated, use the ArcGIS Map Search map to find documents related to a specific location.
4. Click on the map or type specific keywords to view a list of documents tagged with attributes related to the map location.

ArcGIS Maps for SharePoint works directly with an organisation's ArcGIS subscription to allow the users to access geographic content to enhance their business data. With ArcGIS Maps for SharePoint, the user can add data from ArcGIS or the SharePoint lists to the map to visualise the data in new ways. Once the desired maps and layers in ArcGIS Maps for SharePoint are created, they can be published to ArcGIS to share them with others. ●

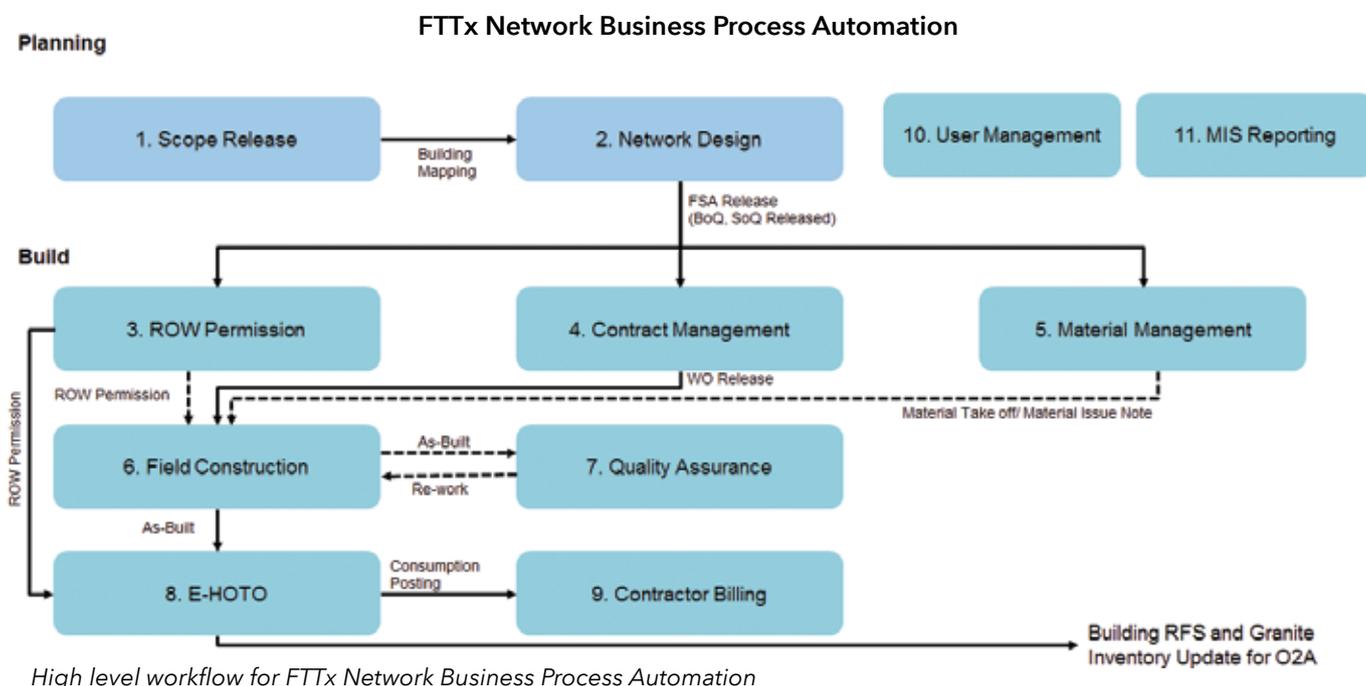
ROLE OF GEOSPATIAL TECHNOLOGY IN USHERING DIGITAL REVOLUTION IN INDIA

Reliance Jio Infocomm Limited (RJIL) is shaping the future of India by providing end-to-end digital solutions for businesses, institutions and households, bridging the rural urban divide, through cutting-edge voice & broadband network and rich digital services. On - boarding 140 million mobile customers in a year is testimony of Jio's success!

RJIL aims to provide the wireless and wireline services to customers through LTE, WiFi, and FTTx (Fibre to the Home/Building/Premise). With availability of numerous internet - based applications, India is witnessing a tremendous increase in data usage and heavy demand for high speed internet, both in consumer and commercial segments. Focus on broadband networks, affordable smartphones, availability

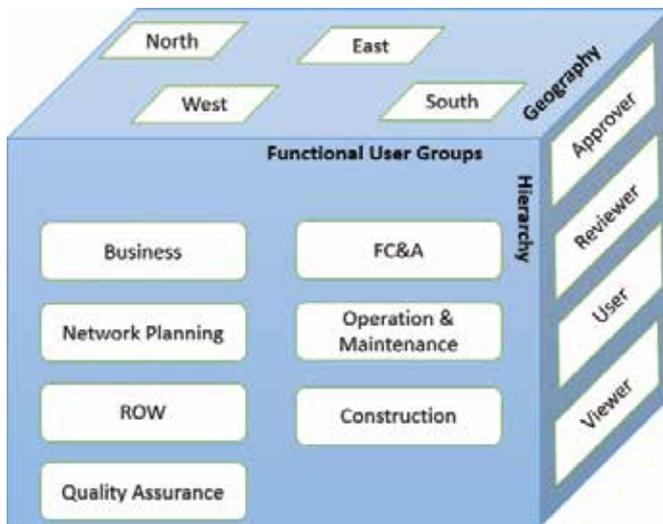
of rich content and applications has enabled Jio to offer a unique combination of telecom, high speed data, digital commerce, media and payment services. This has propelled Jio to acquire about 140 million customers in just one year.

With its extensive, future - proof full - IP network, RJIL plans to serve 20 million FTTx customers. Jio's FTTx network will enable customers to enjoy the rich content, applications and solutions over 100 Mbps bandwidth at every home and business. This will involve expanding its current fiber optic network of 2.5 lakh km by another 1 lakh kms. Jio has released integrated, end - to - end workflow based business process automation on the geospatial platform to efficiently deliver this huge incremental network for providing affordable services across India.



User Groups

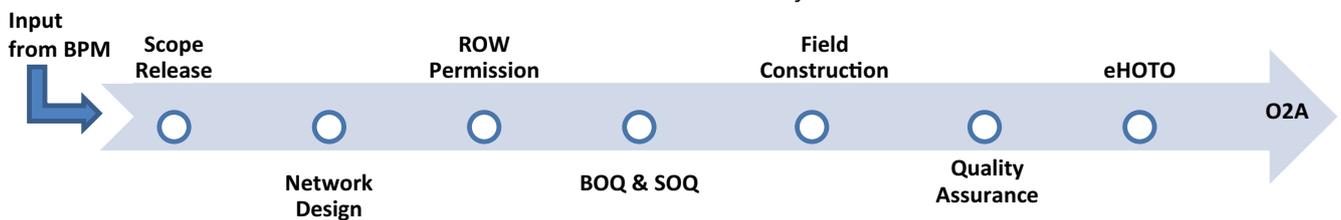
There are seven major user groups consisting of more than 2000 users located across India. This solution is accessible to both employees and contractors. Users are centrally handled through a user management system, created on basis of functionality, geography and hierarchy.



User Groups

Milestones

The FTTx application suit consist of a BPM engine for Business Workflow & Dashboard, Desktop & Web GIS applications, Mobile GIS Apps (built on top of ArcGIS for mobile on android platform) and GIS - based web - service interfaces covering the major milestones of network roll - out.



Network Roll-out Milestones

Detailed Steps

FTTx end to end activities are executed using BPM, and web and mobile based GIS solutions in the following manner:

1. Business users carry out building survey and prioritize Areas of Interest for network roll - out.
2. Network Planning and Engineering (NPE) issues network design and field teams confirm route feasibility after joint field survey with construction and local business teams.
3. NPE releases final design based on route feasibility, complete with BOQ and SOQ. This informa-

tion is transferred to SAP MM for capex and material management.

5. Right of Way (ROW) is managed by construction team and construction is carried out based on ROW, materials and contractor mobilisation.
6. The work is assigned based on distributor serving area (DSA).
7. As - Built data is updated by the field construction. The installation and data QA/QC is also carried out using field GIS.
8. The As - Built Data is converted to Network Inventory in Ericssons Network Engineer , elements and connectivity is transferred to OSS for provisioning.
9. Integration with tableau for various types of reports for all stakeholders and management is done.
10. As - Built Network assets are Handed Over to and Taken Over by (HOTO) O&M.
11. Lastly the Building is declared as Ready for Service (RFS) for Service Fulfillment & later for Service Assurance in BSS and OSS with start of O2A journey .

Conclusion

1. In - depth understanding of geo - spatial technology and its benefits resulted in implementing FTTx Business Process Automation Solution on Esri's ArcGIS platform, benefiting large user base of 2,000 users across India.
2. End - to - end business process implementation instead of GIS as a point solution.
3. Substantial automation reducing hundreds of thousands of man - hours in network plan and build process.
4. Quality records for life - time maintenance.

5. Instantaneous communication between project teams and individuals results in zero idle time.

Yeshta Bhatt

Business Analyst, Reliance Jio Infocomm Limited

Nagesh Nangi

Development Lead, Reliance Jio Infocomm Limited

Yogesh Dhomkar

Assistant Vice President, Reliance Jio Infocomm Limited

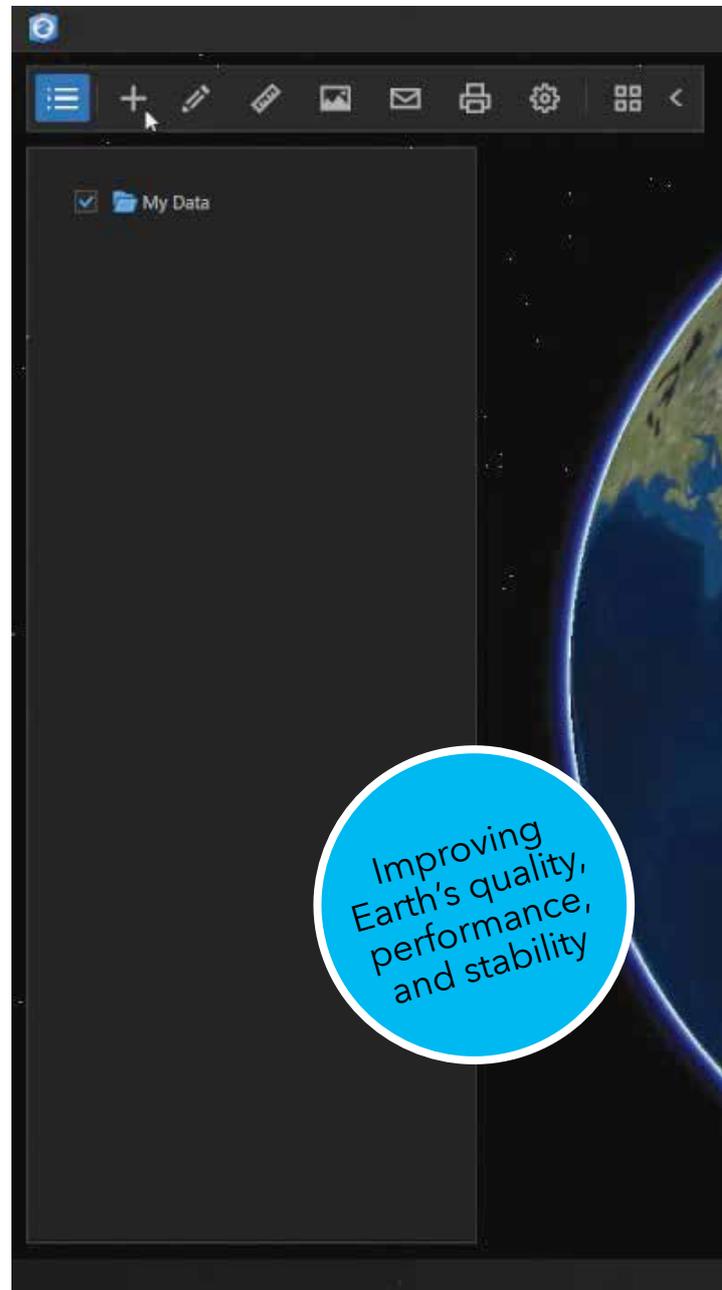
Going around the world? This is what ArcGIS Earth facilitates by enabling the user to zoom from the view of the globe to the rooftop of his house. We can explore terrains, oceans, and mountains anywhere in the world using ArcGIS Earth. Whether it's a property site or planning design, ArcGIS Earth allows the user to add the third dimension and see details he might miss in 2D. The user can instantly open KMLs, shapefiles, or web services and view them in 3D. ArcGIS Earth has everything one needs to easily understand spatial information to get the full picture.

What's new?

The latest in ArcGIS Earth is **ArcGIS Earth 1.7**. ArcGIS Earth 1.7 takes advantage of ArcGIS refined Runtime architecture, improving Earth's quality, performance, and stability.

The major performance improvements include:

- Improved UI responsiveness when loading content and navigating.
- Improved dynamic 3D visualisation.
- Enhanced label rendering in multiple languages.
- Support for billboarded symbols.
- Improved rendering performance for KML and drawing elements.
- Enhanced support for transparency on feature layers.
- Reduced memory usage when viewing tiled layers and scene layers.
- Improved display of tile layers across a scene.



ArcGIS Earth 1.7

More focus on ease of use

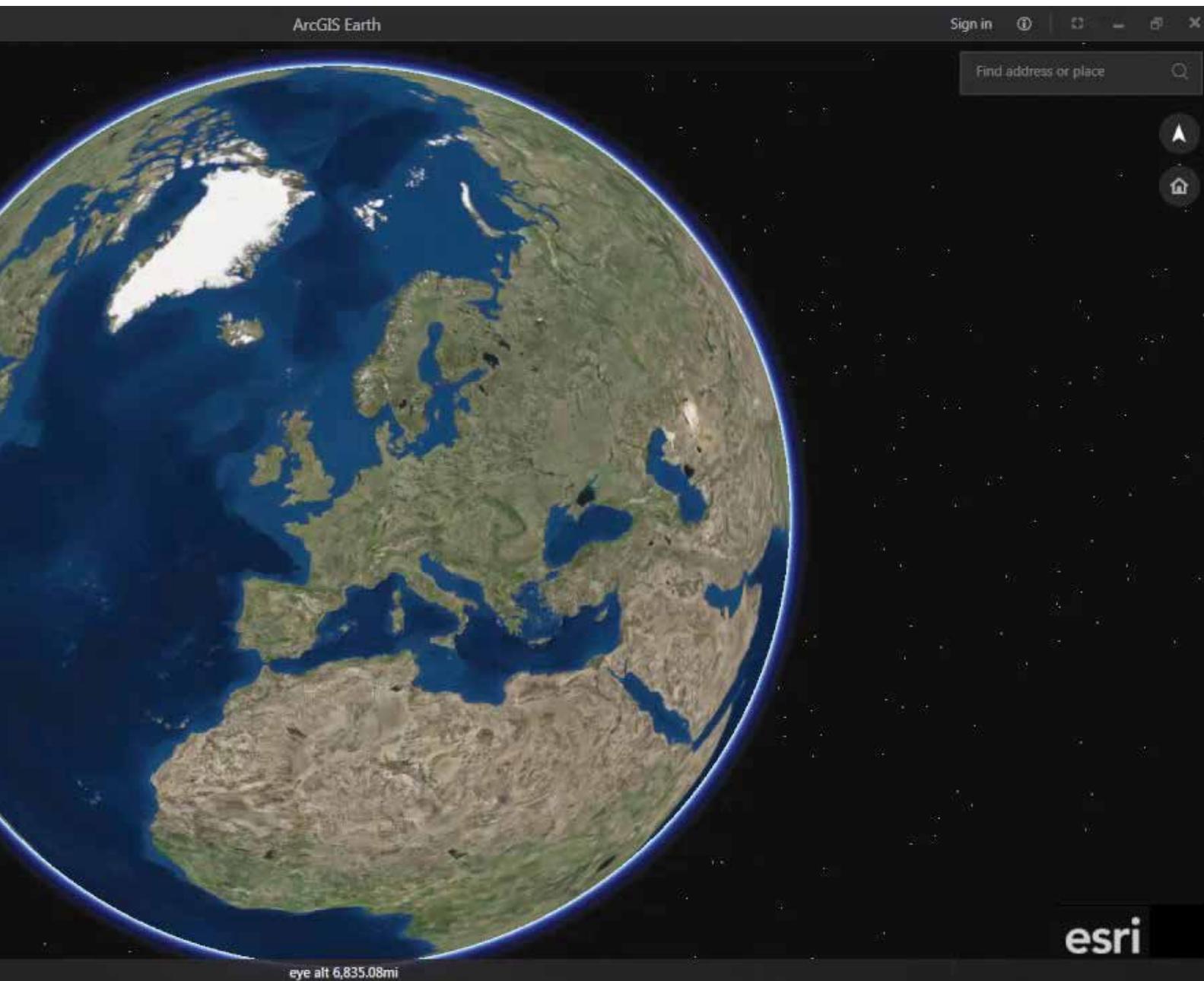
One of the key design themes for ArcGIS Earth is ease of use. In **ArcGIS Earth 1.7**, special attention has been paid to make the startup experience for first time users as easy as possible. Administrators can simply customise these default 'Startup criteria' based on the needs of their organisation, by modifying the HTML files in the tips folder located in ArcGIS Earth's installation directory.

ArcGIS Earth 1.7 also improves the ability to identify and display metadata and attribute information for map services, image services, as well

as WMS services on the globe. ArcGIS Earth has additional capabilities for imagery as users can control opacity, brightness, contrast, gamma controls, and transparency without having to change the source data.

Expansion in supported data types

ArcGIS Earth can use a variety of data from ArcGIS Online, ArcGIS Enterprise, and web services. Earth can also run disconnected and users can add and view local file data from their computer. These can be in the form of shapefiles, KMLs, txt or csv, scene layer packages, 3D models as well as Raster files. With each



release the data types are getting expanded and in 1.7 additional raster types have been included. They are:

- High Resolution Elevation (HRE) raster format
- 2000 format with .j2c and .jpx extensions
- NITF format with the .nsf extension

ArcGIS Earth continues its support for open data and 1.7 adds new functionality for OGC WMS and WMTS including:

- Get layer capabilities when adding OGC WMS.
- Get feature information of OGC WMS.
- Add WMS and WMTS from

ArcGIS Online and ArcGIS Enterprise portals.

Additional features

Menu operations for KML sublayers include zoom to layer, expand all, and collapse all. Users can now support brightness, contrast, and gamma appearance settings for ArcGIS dynamic map services. Some of the additional features include:

- Additional support for reloading disconnected data in the table of contents.
- Import and add online images as a placemark icon or as pop-up content of the drawing element.
- Display dynamic attribute infor-

mation of imagery layers.

- Preview metadata of the listed portal items from the add data pane.
- Improved loading experience for CSV and TXT format data.
- New dump file mechanism.

ArcGIS Earth is used to aggregate, visualise and share multiple types of spatial content including KML in a free, lightweight and easy to use desktop client. It is secure and easily deployable across large organisations. Over the past 45 years, Esri has committed itself towards supporting the geospatial community around the world, and **ArcGIS Earth 1.7** is aptly taking the legacy forward. 📍

Drone2Map for ArcGIS 1.3.1

Drone2Map for ArcGIS is a desktop app that turns raw still imagery from drones into valuable information products in ArcGIS. It helps in creating high-resolution orthomosaics, digital surface models, multispectral indices, detailed 3D colorised point clouds, 3D textured meshes, and 3D PDFs.

The latest Drone2Map for ArcGIS 1.3.1 includes the following new features and enhancements:

- Added Support for rolling shutter optimisation on Sequoia cameras.
- Multispectral image tiles are now composited and ready for use in ArcGIS Pro.
- Orthomosaics created from multispectral imagery now have band names included in the metadata.



- Added ability to edit group names in Image Properties.
- Added option to automatically classify point clouds.
- Improved DTM algorithm.
- Improved orthomosaic color balancing algorithm.
- OSGB mesh output format added.
- Processing speed improvements in mesh texturing.
- Hidden faces on meshes get a more consistent texturing.
- DJI Spark camera added to camera database.
- View GCP photo attachments from file geodatabases and hosted feature layers.
- Added support for DJI Zenmuse XT FLIR.
- Added support for Sentera Quad Band Sensor.
- Fixed projects failing to reopen with Norwegian OS locale and comma decimal delimiter set.
- Fixed image viewer bug failing to export annotated images as jpeg.
- Fixed bug when removing images from image properties that were not being removed from the project.
- Fixed NDVI images failing to open on shared web maps in Portal for ArcGIS.
- Fixed mesh displaying wrong name when added to ArcGIS Pro.
- Fixed bug with image altitudes not adjusting with German regional settings applied.
- Fixed authentication through a proxy using Domain Authentication.
- Fixed ordering of bands for multispectral imagery. Bands will now default to Red, Green, Blue, Band 4, Band 5, etc.

Bug fixes

This release of Drone2Map includes the following bug fixes:

- Fixed inspection points not displaying when sharing to web map.
- Fixed crash when sharing imagery layers to ArcGIS Enterprise 10.5.1 (Japanese Language pack).
- Fixed display issues with hosted tile layers generated from multispectral imagery.
- Fixed pixel shape of NDVI images not matching the orthomosaic.
- Fixed sharing of Imagery Layers to groups and everyone.



What is a Drone2Map project?

A Drone2Map project is a collection of files and directories used to store the associated processing, products, and map parameters. The elements of the Drone2Map project vary based on the template used.

All projects include the following:

- Line features of the drone flight path
- Point features with geolocations of the images collected during the flight

The available project templates can generate the following products for the collection area:

- An orthomosaic
- A digital surface model (DSM)
- A digital terrain model (DTM)
- Contour lines
- A normalized difference vegetation index (NDVI)
- A 3D colorized point cloud of the collection area
- A 3D textured mesh of the collection area
- A 3D PDF file of the textured mesh

Installing and authorising Drone2Map for ArcGIS

To use Drone2Map, the user needs to have an ArcGIS Online subscription or Portal for ArcGIS account with a Drone2Map license provisioned.

Free trial with ArcGIS Online

If a user already has an ArcGIS

Online subscription but have not purchased Drone2Map, he can use a free trial of Drone2Map. If he doesn't have an ArcGIS Online subscription, then he can request an ArcGIS trial that includes a Drone2Map trial.

Download

If one has an ArcGIS Online or Portal for ArcGIS account, then he can download Drone2Map from My Esri.

Installing Drone2Map

The following steps are to be followed for installing Drone2Map for ArcGIS:

- Start the Drone2Map installation program and click Next.
- Review the license agreement and accept it. Click Next to continue with the installation. If you do not agree with the terms of the license agreement then exit.
- Click Change to specify the installation folder or Next to accept the default location.
- Click Install to start the installation.
- Click Finish to close the wizard when the installation completes.

Start Drone2Map with a Named User license

The user must have an ArcGIS Online or Portal for ArcGIS account that is assigned a level 2 license and has a publisher role before using Drone2Map. The process for starting Drone2Map with a Named User license with ArcGIS Online is different than that of a Named User license with Portal for ArcGIS. With a Named User license, the user can log in to any machine with Drone2Map installed.

Now, with drone hardware becoming more accessible, using Drone2Map for ArcGIS, one can create 2D and 3D maps of difficult terrains easily. Drone2Map for ArcGIS is designed to produce GIS-ready products that can be published directly into an ArcGIS Online account. The benefits are numerous, so, get trained on using Drone2Map through a free course on 'Getting Started with Drone2Map for ArcGIS' from Esri Training today and make use of the best practices to capture and validate your drone imagery. ◆

GIS has provided answers to the most challenging questions on healthcare, homelessness, disaster management, utility, conservation etc. It has helped us to work smarter and live a better life, leaving us to wonder, what's next?

With continuous advancements in technology, a new generation of GIS, based on sharing and collaboration is developing. The first generation of digital transformation involved digitizing workflows and now technology is becoming 'simultaneous.' We are moving towards achieving interconnection of workflows, leveraging technology to interconnect knowledge and engage everyone. As Jack Dangermond, Founder and President, Esri says, "We need to integrate 'The Science of Where' in an accelerated way. We need to envision the future and participate in creating a geoscience-based foundation for our future. I call it societal GIS." This is essential and inevitable.

Geo.AI - An evolving trend

GIS is changing every day with more and more technologies getting integrated with it for more effective outcomes. It would not be incorrect to say that one of

the major integrations that we are looking at today is that of GIS and artificial intelligence (AI).

Because of digitisation, there is an explosion of data in today's world. Businesses largely need to collect data to be able to answer questions and analyse what happened. It is said that 80% of the data has a location aspect to it which is related to GIS. And to be able to use that data to find out not just what happened, but also predict what might happen, machine learning, deep learning and AI comes in. To be able to answer complex questions about why things happen, what happened and what might happen and to know the unknown, we need to analyse the data, and this is where AI helps. Using intelligent algorithms, data classification and smart predictive analysis, AI has its utility in a large number of sectors. A more specific subset of AI that combines the exactitude of GIS with the razor-sharp analysis and solution-based approach of AI is termed Geospatial AI or simply Geo.AI.

Geospatial AI can also be called a new form of machine learning that is based on a geographic component. The applications of Geo.AI are increasing in a number of sectors. Ride-sharing companies, logistics, farming, surveying, and infrastructure are some of the prom-



GIS INSPIRING WHAT'S NEXT

With continuous advancements in technology, a new generation of GIS, based on sharing and collaboration is developing. We are moving towards achieving interconnection of workflows, leveraging technology to interconnect knowledge and engage everyone.

inent examples. Ride-sharing companies like Uber, Lyft etc. take feedback from customers and then process the data to find out the density of cars and the availability of drivers. In logistics and supply chain, Geo. AI can plug the gaps and gather more accurate location information that can streamline product delivery and save time.

AI is here to stay, and it's only natural that GIS should integrate with AI and all those capabilities should come within GIS. In the realm of business, Geospatial AI substantially improvises planning, resource allocation, and decision-making - predicting the surge in demand and supply, identifying the prospects of high and low margin, multiplying supply chain efficiency, and optimising service delivery. The scope of Geospatial AI is simply endless.

For instance, in Tokyo, a group of companies is using location-enriched Big Data and AI to place cabbies at the intersection of supply and demand, hoping that AI-based predictions will give them a competitive edge.

Toyota Motor Corp. has partnered with JapanTaxi, KDDI, and Accenture to pilot what the companies call an AI-based taxi dispatch support system. The dispatch system applies AI to predict where and when taxi service will be in demand.

AI has made a name for itself by extracting value from massive datasets. In this instance, the Big Data includes a trove of static and dynamic location-related information, from taxi

logs to Tokyo event calendars, weather, traffic, and cell phone location. Toyota says the AI technology, using anonymized location data, predicts people's movements by time and location. The dispatch system displays this information on a map that appears on a tablet, which taxi drivers can access in their cars. The taxis' on-board maps show drivers the predicted number of occupied vehicles in certain locations, as well as areas of possible demand. Acting on this information, during the trial, the taxis saw an average sales bump of 20 percent.

Geo. IoT - making more sense of location

Internet of Things (IoT) is already being used across industries

such as smart cities, public safety, agriculture, healthcare, utilities and transportation. In city management, IoT has applications for smart street lighting, traffic management, intelligent cameras, solid waste management, pedestrian tracking and much more. For power utilities, Smart Metre deployment and management offers the ability to better manage energy consumption and real-time network events.

With increase in IoT applications, multitude of devices are connected together, generating huge volume of data in real-time. Sensors are now connected to devices that are constantly being monitored and they keep giving real-time feeds of what they are observing.



GIS with AI enables sales decisions on the edge

Consider that a customer has just bought a new product such as a high-end TV, and a sales rep, with a tablet computer in hand, is presented with several scenarios: selling the customer related products (say, home theatre speakers), an extended warranty, or additional services—perhaps the installation of a home theatre system that includes the speakers.

The intelligent system knows to present the sales rep with a small range of incentives that have led to sales in past transactions: HDMI cables at no cost, an extra year of warranty coverage, same-day installation, or other niceties.

With the help of GIS, the slate of options shown to a sales rep in the Los Angeles area will differ from the one shown to a Philadelphia sales rep, because customers gravitate to different products/services and respond to different sales tactics in those locations. With hyperlocal intelligence, employees at two Philadelphia stores a few miles apart will be guided toward different options. In both cases, instead of the middle manager trying to remember the best slate of offerings and incentives for every circumstance, there's a data-driven, repeatable process of delivering the best outcome for the customer and the business.

The intelligent system provides a set of best choices, not a final judgment. It democratizes the company's data to permit decisions on the edge. Such a system also allows the person who is dealing directly with the customer to consider the nuances and emotional atmosphere of the interaction when planning a response. In the process, it saves time and money by minimizing the number of people needed in the decision chain.



These could be weather sensors getting weather data around the clock at each location, traffic cameras at the intersections that are monitoring the traffic or the pedestrian workflows, sensors in transmission towers or electrical grids or communication networks which are monitoring how the devices are functioning. These sensors are generating a huge volume of data attached to different locations.

Making sense of such a large volume and velocity of data requires a seamless integration of location capabilities of these devices. This is where GIS plays an indispensable role in enabling the IoT ecosystem. GIS can ingest high volume data streams from stationary and moving devices and perform real-time spatial analytics, generating immediate geographic insights. One can dynamically assess geographic patterns, predict sensor movement, share data and take immediate action to reduce cost, ensure availability, increase performance and capacity, and improve safety of operations.

The combination of data from the IoT and spatial analytics from GIS enables organisations to take a prescriptive step toward saving lives and money, rather than simply predicting outcomes. A geospatial ecosystem of shared data makes it easier for utility compa-

nies, emergency providers, and anyone else providing community services to understand data, act in real time, and ultimately improve the lives of citizens.

GIS and IoT in utilities

Historically, GIS has been used in the utilities industry to make hard copies of maps illustrating the location of assets. While GIS was developing into a technology that allowed more information to be incorporated into geospatial analysis in different ways, utility companies were placing more sensors into the field.

The new electronic meters are sensors themselves. They tell the electric company how much electricity someone uses and when. Sensors, known as fault indicators, let utility companies know when equipment is malfunctioning in real-time. While the initial purpose of these sensors was to help utility companies access information in the field they have evolved into conduits for transmitting parts of a larger geospatial picture.

Utility companies are now combining this collection of sensor data with spatial analytics to gain insight and improve decision-making. Sensor data from the field is not only shared in real-time with the home and office, but also fed back to the workforce in the field,

who can access this shared data via mobile devices. Real-time monitoring and support is taking customer service to new levels and mitigating energy saving concerns to a large extent.

In the future, sensors will also be used to make targeted decisions about power usage at a more precise level, as well as inform consumers. Soon, sensor technology will be available in energy consuming appliances like refrigerators, enabling utility companies to monitor exactly which devices are consuming the most electricity. Rather than announcing a community-wide flex alert, electric companies would now be able to make targeted recommendations to those households that are using more power, instead of also including the ones who are already conserving. Additionally, electric cars, which have a limited range, equipped with sensor technology will alert drivers where the nearest charging station is. Once data from vehicles is collected on a large scale and integrated with weather data, GIS can be used to predict where and when slippery conditions will occur, preventing accidents.

IoT for public safety

In law enforcement, time is of the essence. For a police department to stay on top of everything that happens in the city—crimes, accidents, and traffic, it needs to have a real-time system of data collection and analysis in place. With real-time spatial analysis, the police department can determine the most effective response to an incident as it is happening. Spatial analysis can be used to quickly compute optimal paths along linear networks and take into account the asset's capabilities, distance

to the incident, traffic, and road conditions. Operation centre managers and dispatchers can use maps to make sense of what's going on and determine the best course of action.

Real-time GIS is ensuring public safety at all times. Consider the case of the Chicago Police Department, which rolled out their new command and control centre in 2015. A key feature of the centre is the live digital maps that dominate the wall of large monitors facing everyone in the room. Getting the right information to the right people at the right time can sometimes become a matter of life and death.

Before this new system was in place in Chicago, officers, most of the times had to wait an hour to get the right information. Now they can get it immediately. This system provides a real-time look at every crime and incident in progress as well as the exact location of every police asset. Officers can also use the system to take control of any of the 25,000 cameras available citywide. It's designed to put the right information in the hands of police, where they need it and when they need it. So, is the power of IoT, an important 'next' in GIS.

Augmented Reality (AR) in GIS

AR and virtual reality (VR) are the next big things in the GIS industry. With AR becoming more prevalent in phone, tablet, and computer applications, more and more developers have started integrating GIS services and content to serve very real and practical purposes. Take for example, a project led by the Fraunhofer Institute that Esri Deutschland GmbH is engaged in called Morgenstadt

– City of the Future. The project uses 3D technology and VR to work on predicting, developing and implementing innovations for tomorrow's cities. Esri technology is being used to generate 3D urban models, a key planning tool for towns and cities, which can be used in conjunction with AR and VR to make the planning process more transparent. Simulations of the spread of noise/pollutants or of areas exposed to the sun or in the shade help workable, sustainable decisions to be reached. Using these models along with AR and VR opens up the innovative involvement of city dwellers and creates a real-time experience.

It isn't just a futuristic vision – this can be applied today in

Esri technology is being used to generate 3D urban models, a key planning tool for towns and cities, which can be used in conjunction with AR and VR to make the planning process more transparent.

your work environment. Maybe oil workers have a tough time laying pipe in a remote location. They might not necessarily know what a coordinate is, but what if you could draw a red 'X' on the spot where the pipe should go? What if you could shade an area in red that is dangerous for them to go into, or the land in that area is owned by another entity and they need to be careful not to lay pipe in this area?

What about finding a hidden asset like a pipe or valve in that remote location – when the field is covered in snow? Using AR, the exact location can be immediately understood and found, without spending five hours shoveling snow.

Another example could be city

and county governments and how they deal with building encroachments.

Managing right of ways is tough. Today, a surveyor is sent out to measure the structures that are being built in someone's backyard to ensure they do not go into the right of way. This is expensive and can take a long time. Many cities do not employ a lot of surveyors to handle this and they have many jobs. What if, instead, a surveyor could dispatch an intern to go take a picture, impose that picture into the GIS data and check for encroachment? The surveyor can go later to check projects that are questionable, but AR technology can very quickly ease the work burden and save the city or county – and ultimately you, the tax payer, money. Connecting a

world of data like this for people who may not be familiar with GIS is really powerful, and AR is making this happen.

Earth observation and GIS

GIS has greatly improved imagery intelligence through the use of Big Data management technology, imagery analysis tools, and artificial intelligence. GIS imagery tools help users tease out information from images more quickly and accurately, and AI augments that analysis by identifying specific features on the ground.

Using these technological advancements, some business analysts and consultants are already delivering intelligence-based commodity



reports and confidently recommending business and investment decisions.

Companies like Ursa Space Systems Inc. and Orbital Insight Inc. are using satellites to try to shed light on tightly held secrets in the commodity trading world, from coal mine productivity to crude oil storage. While doubts remain around the accuracy and consistency of the data, there could come a day when traders can track supply and demand of raw materials, the operations of

needs extra coal and who has surplus to sell, in near real-time, giving traders leverage to negotiate sales and purchase agreements and create arbitrage opportunities. This kind of analysis could bring unprecedented benefits to the businesses.

Maturity of GIS is helping users to do their work better and communicate in many new ways. Based on the power of WebGIS, smart maps, Web maps, location analytics, GIS is bringing everything together like a

Maturity of GIS is helping users to do their work better and communicate in many new ways. Based on the power of WebGIS, smart maps, Web maps, location analytics, GIS is bringing everything together like a constellation.

producers and consumers and even the output of entire economies in near-real time.

For example, a coal trader may want to know when demand is going to exceed supply, driving up prices. Satellite images could measure the piles of coal outside power plants to see when they're getting low and need to be refilled. They can count trains and track ocean tankers carrying supplies. They can measure ground levels, pile heights and truck activities at mines to deduce production. Put it all together and the data could paint a picture of who

constellation. Web maps are becoming a common language for problem solving. Apps are taking 'The Science of Where' everywhere. Earth observation combined with AI and GIS is providing us with real-time intelligence.

When companies create AI-based, location-aware tools that help employees respond more precisely to customers' needs and relieve middle managers from repeated intervention in the sales or service process, those companies can boost revenue and reduce the cost of sales and service. To bring

more efficiency, companies are capturing and digitizing best practices. They are then incorporating those best practices into user-friendly platforms that offer employees real-time options for dealing with customers, service decisions, and potential sales. And they're adding location intelligence to deepen the insights into customer behaviour and service decisions and to further customize the suggested best options.

Sensors are now connected to devices that are constantly being monitored and they keep giving real-time feeds of what they are observing. Because that data has location attached to it, its integration with GIS is inevitable. And as we do it, the outcomes are extraordinary.

Augmented reality provides a whole new experience of visualising a scenario, and when combined with GIS, it not only provides excellent visualization of GIS content, but also enables integration of that content with the rest of the enterprise. At the next level, as GIS professionals successfully achieve perfect integration of AR and GIS, real-time decision making will reach unmatched heights.

GIS is an ever evolving phenomenon, and the list of 'what's next in GIS' will remain inconclusive at all times; as the world transforms, GIS itself is evolving and becoming an interconnected platform, opening, integrating and simplifying everything. Moving to real-time GIS will change everything. As Jack says, "Real-time GIS will shape a smarter world by connecting everyone to create a system of engagement; it will provide dynamic information about everything." ◆

Run your Business on Maps

Saartha is an enterprise software development company with presence in India and Australia. Industry leaders like SAP and Esri recognize it as an "Emerging Business Partner" to build innovative, and user-friendly enterprise applications.

Saartha is poised for growth with portfolio of products –Business on Maps, Asset Planning, and Evolve Business Rules. It has an impeccable record of delivering solutions in

real estate operations, mine planning, the list goes on.

What Saartha envisioned

Saartha wanted to bring location intelligence into SAP solution set to help customers benefit from it. Saartha was looking for an enterprise grade GIS solution to integrate with SAP. Saartha wanted to take user experience with maps beyond visualisation and analytics. The vision was to enable organi-

CRM and SCM systems of SAP with ease. 'Business on Maps' delivers an incredible, next gen user experience, with maps. It is a low code platform, which empowers businesses to geo-enable any SAP transaction by way of configuration. Any business operation can be enabled to run on maps. Furthermore, there are several out of box standard apps like spatial job scheduler and asset maintenance apps that readily deliver ROI as early as 13th week onwards, for a typical implementation.



niche technology areas of GIS Integration, SAP BRF+, S/4, HANA, SAP Fiori/UI5 across diverse industry verticals.

Location Intelligence for SAP solutions

There is a tremendous opportunity for enterprise customers using SAP, to leverage location data in their business operations. As an example, for organisations with large plants or geographically distributed assets, job scheduling considering location is a huge challenge. There are many scenarios, like creating tailored marketing campaigns by location, based on customer demography,

sations to run integrated business operations on maps. The system should also be able to analyse any SAP operational report on map, in real time, without the need to extract, transform and load into GIS systems or other analytic tools.

Esri India joins in

Being a leader in enterprise GIS systems, Esri was the solution of choice for Saartha to realise their product vision. 'Business on Maps' is a product by Saartha that integrates Esri's proven GIS solution with SAP solutions. Thanks to this collaboration, organisations can implement location intelligence in their ERP,

Benefits of the system

Apps like spatial job scheduler enable organisations to save millions in proactively planning their preventive asset maintenance scheduling. Reduced travel time, increased productivity of field crew, eliminating overdue preventive maintenance, increased asset uptime, savings in capital expenditure and operational expenditure are the major benefits in asset management space. In addition to asset management, location intelligence can be implemented in several, business functions. 'Business on Maps' helps unlock more value from SAP investments. ♦

How San Antonio Beefed Up Security for NCAA Final Four

As San Antonio, Texas prepared to host the 2018 NCAA Men's Final Four Championship in early April, a series of bombs exploded in nearby Austin.

"That put everybody on edge, then one of the bombs went off at the FedEx transfer facility in Schertz, which is just 17 miles up the road, and it brought the risk home," said James Glass, Deputy Director, Southwest Texas Fusion Center, one of many such centers across the US that collaborate with all first responders to detect, prevent, investigate and respond to criminal and terrorist activities.

"For the NCAA games, people were paying closer attention," said Douglas Berry, San Antonio Fire Department Battalion Chief. "There were a lot more reports of suspicious packages, and the ability to vet those quickly was very important."

Forces on foot

The NCAA Final Four weekend in San Antonio included a three-day music festival at Hemisfair Plaza, a fan fest at the Henry B. Gonzalez Convention Center, and games at the Alamodome. With all event venues within walking distance of each

other, hundreds of thousands of people milled around the city's compact downtown. San Antonio deployed a large force of on-foot officers to ensure safety. The challenge for the Southwest Texas Fusion Center was twofold: give every officer the maps and data they needed for each event and maintain visibility of each officer's location.

"We had been getting details on temporary setups from the NCAA months in advance," said Sean Cummings, Public Safety Enterprise GIS Solutions Supervisor at City of San Antonio. "We put all of the details on the map, including the buildings, the booths, the road closures, the entrances, the access control points, the stage, and where lines would form."

The Fusion Center deployed these maps to more than 200 networked smartphones. At command centers, staff could track and share the identity of each phone, and officers could search the map and share photos tied to locations.

Vetting suspicious packages

Word went out well before the events that attendees could only bring a clear bag no larger than 12-by-6-by-12 inches. Despite this widely broadcasted

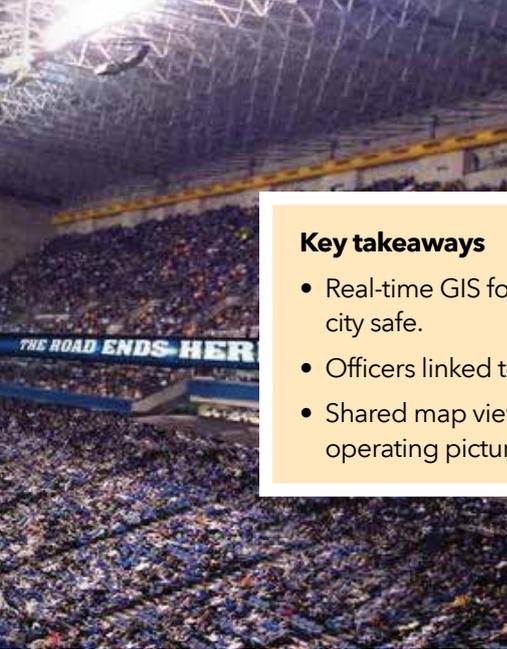
message, and free bags distributed at multiple locations, many people brought bags that they ditched when they realized that they couldn't bring them inside a venue.

This led to many suspicious bag reports and follow-up responses from officers and joint hazard assessment teams (JHAT) that specialize in bomb and hazardous material threats. With each call, came a rough location. Command post staff used a live common operating picture to correlate each report with the real-time location and input from responding officers. They also were able to access and point the closest CCTV camera to capture and share a view of the scene.

More big moments

At many crucial moments during the NCAA weekend, maps proved vital for those charged with public safety.

A few hours prior to the final game on Monday night, the Fusion Center team went out for a quick meal. Just then, they received two suspicious package alerts. Instead of rushing for the door, staff pulled out their phones to look at the live map. They watched a play by play as the package was



Key takeaways

- Real-time GIS for situational awareness keeps city safe.
- Officers linked to incidents for faster response.
- Shared map view provides a common operating picture.

way into a small and crowded area caused some minor injuries in the crowd.

The Fusion Center now centralizes calls for service and aggregates intelligence from a variety of different systems. Using mobile phones

investigated and revealed to be a harmless diaper bag that had fallen out of a minivan. This real-time situational awareness brought relief, and a much-needed dinner break, to Fusion Center staff.

During the March Madness Music Festival, Fusion Center staff noticed a sudden convergence of officers near the main stage. Training a camera on the gathering, staff noted that officers were not responding to an incident but were showing support for performer Jason Aldean, a country music star who was last on stage in Las Vegas in October 2017 when a gunman opened fire on the crowd. The officers gathered for an impromptu “we’ve got your back” moment, making their presence known to the performer and the crowd.

In command centers throughout downtown San Antonio, dashboards displayed details beyond the live common operating picture. Staff could see an incident log for different zones across all venues and a running tally of events with levels of activity. Dashboard users could zoom into each logged event for more details. Another dashboard provided the historical record, parsing the number of calls for service and types of calls over time.



The command center at the Southwest Texas Fusion Center displayed a variety of details to keep on top of calls and incidents.

Fusing intelligence

Law enforcement agencies increasingly share intelligence, and today’s digital workflows make this easier. San Antonio set up its Fusion Center more than ten years ago, taking an all-crimes and all-hazards approach to information sharing across the city’s public safety community.

The need for a new special event management solution centered in the Fusion Center became apparent after an incident at the city’s annual ten-day Fiesta historical celebration. When someone passed out from heat exhaustion during the parade, emergency medical staff rushed in to help. Seeing this, nearby police officers thought it was the beginning of a fight and moved in. The two groups forcing their

for the NCAA event made fusion easier than ever before by getting everyone on the same page fast. FBI agents, plainclothes police officers, and various food inspection and ordinance enforcement personnel each had their own phones. Everyone with a phone could easily access relevant information and communicate with their peers. Live tracking of each phone’s location gave the command centers a clear picture of available resources.

Accountability has become a driving force in law enforcement with the advent of body cams and bystanders taking and sharing images and videos from their phones. The solution San Antonio deployed for the NCAA Final Four helped in the moment and afterward by providing a record of the event. ♦

How to Use Maps in Story Maps

Maps are a critical component of a good story map, but there's more to it than just dropping in a web map at the right point in your story. Using maps effectively requires effort on the part of the author to ensure the maps look great, support the story, and are explained sufficiently within the story narrative.

We present here a few tips that will help you understand the role of maps in a story map, the mechanics of adding and configuring maps, and how to use the features of Esri's Story Map Builders to create effective reading experiences (using maps, of course) for your audience.

Adding maps to a story map

Any time you add a map to a story map you have an opportunity to change its appearance. This is one of the quintessential features of story maps: You can alter any map to best tell your story.

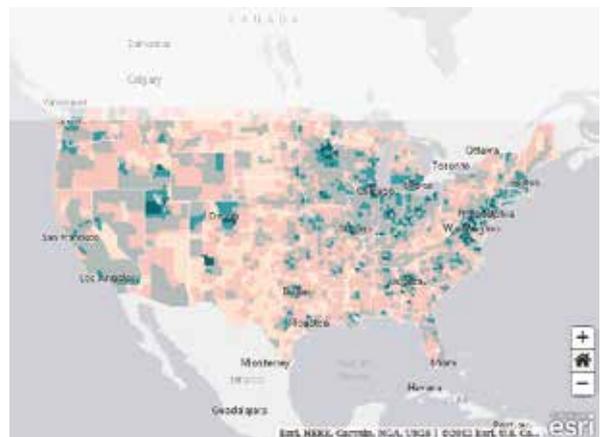
In your story, you can adjust the appearance of a map in any or all of these three aspects:

- Set which layers are visible
- Adjust the area shown (the map extent)
- Show more info about a particular feature (the pop-up)

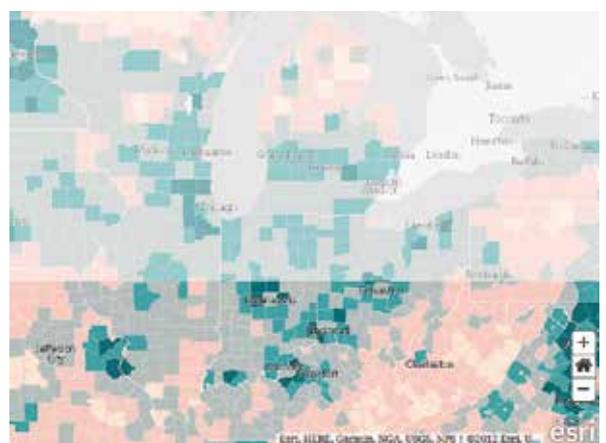
For example, Let's say you are working on a story about housing trends in the Midwest. You find a great map of mortgages in the US in Esri's Living Atlas and add it to your story. It initially shows the continental US.

You can easily modify how the map appears in your story so it shows more detailed information for the states in your focus region.

Any alterations you make are stored as configuration overrides in the story map and don't affect the state of the web map. In this

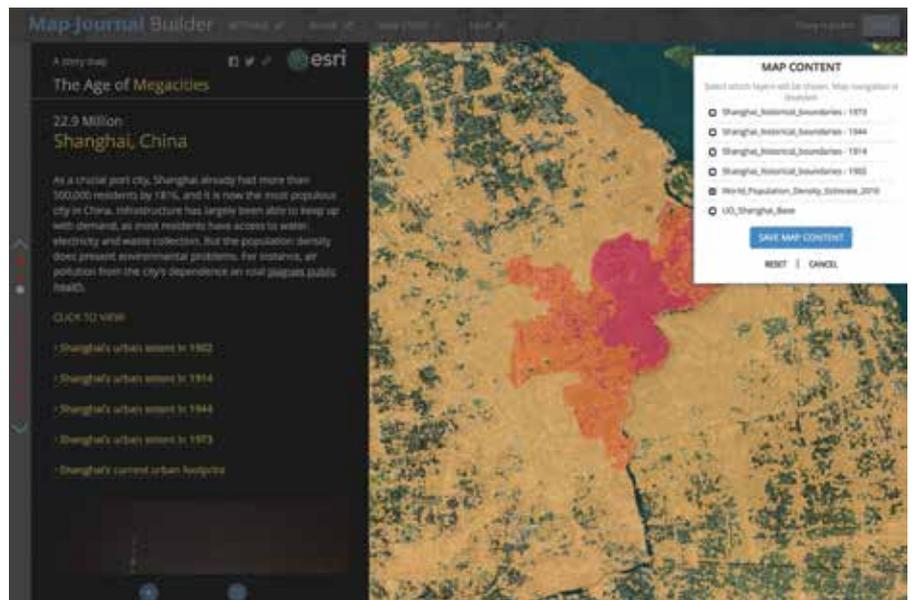


Housing with mortgages from Esri's Living Atlas



Same map, different view

case, you don't own the web map so it's not possible for you to save changes to the map itself (unless you save your own copy – more on that later). But since Story Map Builders let you independently store map configuration changes you're able to easily use someone else's map to tell your story, even if it requires some modifications.



Custom configuration mode for content (visible layers) in Journal and Series

Adjusting a map's appearance in the Story Map Builders

So, how do you change a map's appearance when you add it to your story in one of the Story Map Builders?

In Story Map Cascade, you adjust the appearance of a map on the 'Appearance' tab of the media configuration panel. Look for the blue outline to know you're in map configuration mode. Any changes you make to the map's extent or visible layers (using the layer list in the upper right) while the 'Appearance' tab is active will be saved. Likewise, if you click a feature to make a pop-up appear, that pop-up will also be saved open for that map in your story. There are three "reset" buttons (under 'View' in the configuration panel) that you can use to return the map to its saved state.

In Story Map Journal and Story Map Series, you make map appearance changes when adding or editing a section's or entry's Main Stage configuration.

Clicking 'Custom configuration' for any of the three map properties will launch an interactive mode where you can change that aspect of the map. For example, creating a custom

configuration for 'Content' will show a layer list where you can toggle layer visibility. If you use the same map at a different point of the story, you can set a different appearance for that instance of the map.

Modify an existing map

As discussed above, you can modify some aspects of a map's appearance to fit your story, like its extent and visible layers, in the Story Map Builders. But sometimes while building a story you need to make more significant changes to a map. You might need to alter a layer's styling (GIS nerds call this "symbolology") or what information is shown in a pop-up, or you might have to add layers to the map.

These changes are more than just overrides, they require you to edit the original web map. But don't worry, in these cases you can still make these changes without leaving your story's builder.

You can modify some aspects of a map's appearance to fit your story, like its extent and visible layers, in the Story Map Builders.

In Cascade, you can open the map editor using the 'Edit' button you'll find on the 'Manage' tab of the media configuration panel.

In Journal and Series, there's an 'Edit' button in the section (or tab/entry/bullet) configuration panel that will open the current section's map in the map editor.

Create a new map

Just like you can modify maps in the Story Map Builders, you can also create brand new maps. So if you don't have the map you need for your story, just go ahead and make it!

In Cascade, there's a 'Create a New Map' button on the ArcGIS tab of the media picker.

In Journal and Series, there's an option to 'Create a map' in the section/tab configuration panel that will open the map editor so you can create a brand new map.

Using the above-mentioned tips, you can effectively configure the appearance of web maps in your story maps. If you explore more, you will find more storytelling features provided by the Story Map Builders to make the maps in your stories come alive. 📍

A woman with long dark hair and glasses is leaning over a wooden table, looking at a map or document. The background is a bright blue sky. The text 'Upscaling GIS education in India' is overlaid on the image in a large, bold, purple font.

Upscaling GIS education in India

GIS has become a part and parcel of our daily lives and without it we cannot even imagine completion of most of our day-to-day activities.

The *GeoBuiz-18* report estimates the GIS and Spatial Analytics market to grow from US\$ 66.2 billion in 2017 to US\$ 88.3 billion in 2020, growing at a CAGR of 12.4%. This high level of growth would require trained and qualified manpower to cater to the needs of the industry and further innovation. To bridge the palpable demand-supply gap and to promote GIS as a lucrative career option for the youth and tap their potential, a lot needs to be done and primarily this would require a calibrated multi-pronged strategy and active coordination between the industry and academia, along with support from the government.

This, of course, should go hand-in-hand along with popularising GIS among the masses and

incentivising the establishment of either GIS pertaining departments or dedicated colleges and universities.

Introduce early - GIS education in school

To match with the changing needs, organisations that recruit engineers today look at focused skills in Cloud computing or Big Data, Mobile computing or GIS. Because they look for more specialised skills, and GIS is one of the core areas where there is a huge demand for skills, the demand would only increase. And until we have premier educational institutions imparting knowledge of GIS as a subject, not only would the industry suffer due to a lack of qualified workforce, but India too would lag behind other nations.

However, for building a strong ecosystem of GIS education in India, students in schools need to be made aware of GIS based mapping and its



impact as to cultivate an interest in this fascinating field that helps them choose GIS as the academic discipline in higher education for an exciting career.

Maps convey a lot of information in a very crisp and lucid manner and kids usually find them interesting to look at. This interest should be further enhanced through an interactive and hands-on approach and using visualisations to explain subjects like history and geography. Instead of old-paper based maps, schools can use computer maps or story maps to weave a story that students would find deeply engaging as well as an easy way to learn. Esri India continues to organise projects and workshops in schools across India to promote GIS.

Such workshops introduce the young minds to geospatial and the art of story map-making. These workshops help both the students and the teachers in getting basic knowhow of Esri ArcGIS, using which they weave their own tales into wonderful story maps. The workshops have assisted many schools in leveraging the benefits of including GIS not only in their geography curriculum, but also in history, mathematics, language arts, environmental studies etc., infusing a knack for creativity along the way.

In one such series of workshops, Esri India collaborated with Scottish High International School in Gurgaon last year for a project where students worked on analysing causes of water pollution and ways to control it. It also covered the areas where the government should focus to control the pollution, including the areas to be given priority and more. The ArcGIS based story map was presented at the annual Esri User Conference Going by these

amazing developments at the school level and the enthusiasm shown by students, it would not be an overstatement to say that the technique of story maps has the potential to make learning fun and transforming the pedagogy of school education in India.

It is said that once you imbibe fundamental knowledge in your formative years, the rest of the journey is smooth. So, GIS education in schools

IIT-Roorkee



CEPT University



IIST, Shibpur



is as important as it is in higher education as teaching principles of physics and mathematics in school is a prerequisite for engineering.

GIS in higher education

In engineering streams like Civil Engineering, GIS is a part of the curriculum for some time now. There are many engineering colleges and technical universities who have adopted Esri's platform to teach students about GIS and remote sensing. Most of the IITs use Esri ArcGIS software in various disciplines, for instance IIT Kharagpur, IIT Roorkee and IIT Delhi use it for water management subject. They use it to teach subject likes transportation, earthquake engineering, geology, civil engineering, architecture, agriculture etc.

India has an excellent set of universities and colleges and we need to enable them to ensure that GIS gets established as a strong career option for students to opt for.

There are also many universities that offer graduate and post graduate courses in GIS and Geo-Informatics, including Indian Institute of Remote Sensing and Symbiosis Institute of Geo-Informatics. Punjab Engineering College (a Deemed to be University), Chandigarh is also renowned for its commitment towards capacity building in GIS and its association with Esri India, enables it to be much ahead in encouraging innovation in GIS. The CEPT University in Ahmedabad through its Faculty of Tech-

nology also offers a Master's course in Geomatics. Other than Geomatics, the University also offers 11 electives based on GIS. Students from any course are free to take up these electives. Popular courses include Urban and Regional Planning, GIS in Remote Sensing, Geomatics and Smart City, GIS for Landscape Architecture and GIS for managers.

Esri India and Indian Institute of Engineering Science and Technology (IIST), Shibpur have also in collaboration initiated the Centre of Geospatial Excellence (CoGE) that offers various short and long-term programmes on foundational Geo-informatics and its applications in various government programmes.

Such initiatives make the future of GIS education in India appear bright.

Tackling an obstacle

However, while the country is actively bringing in GIS in its education system, the current Indian GIS curriculum is outdated and needs to be updated soon. GIS is a science where the basics might not change much but the software changes are very dynamic. It is extremely important for universities and the education systems to be abreast with the latest changes.

This could be done by setting a geospatial curriculum regulatory body. For instance, there is a body of Knowledge published by American Association of geographers in the United States that suggests what curriculum should be taught at what level.

In India, a similar body, GIS Academia Council of India, is painstakingly working to prepare new curriculum for GIS in engi-

neering. Esri India is also helping in mapping the curriculum suggestions to NSQF, which is National Skills Qualifications Framework for GIS. Esri India is approaching top government departments to highlight what should be the curriculum as of today plus looking at the future requirements what the committee feels at UG level or PG level, what should be taught at the universities.

Another excellent initiative in this realm is the Esri India's GIS Academy Program (EIGAP), which is especially designed to provide qualified educational institutions with an economical way to acquire select Esri technology for teaching, research, participation in faculty development programmes and also receiving curriculum recommendations on GIS.

Progressing ahead

India has an excellent set of universities and colleges and we need to enable them to ensure that GIS gets established as a strong career option for students to opt for. Learning from past and present situations, the time now is ripe to make appropriate efforts to make national level GIS education policy and well-defined accreditation and certificate procedures. This will help India produce more GIS scientists.

GIS can emerge as a formidable player in the domain of technical education in India and eclipse many of the existing branches and disciplines, if we buckle up, get our priorities straight, foster broad cooperation of stakeholders and expand outreach. And, what's more interesting is that the benefits will spill over everyone - the youth, the industry, the user, in fact, the whole nation.♦

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