

# Arc India News

For Private Circulation. Not for Sale.

## ArcGIS as a Development Platform

### COVER STORY

ArcGIS and Developers

### TECHNICAL ARTICLE

ArcGIS and Open

### BEST PRACTICES

Discover Five Ways to Get the Most out of Your GIS Platform

### CASE STUDY

Vision to Reality: How Reliance Jio used GIS to build India's largest 4G Network



# Esri India Technical Services

Experience the best of Esri technology along with best of technical expertise



## Online Support

[esriindia.com/tech-support](http://esriindia.com/tech-support)



## Support Helpdesk

Toll Free: 1800 - 102 - 1918

(9:00 a.m. - 5:15 p.m. IST, Monday-Friday)



## Email Support

[customercare@esriindia.com](mailto:customercare@esriindia.com)





## PRESIDENT'S DESK

We are witnessing really exciting times in India. Government programs such as Digital India, 100 Smart Cities, Swacch Bharat and Skill India are aimed towards transforming India. In addition, we are witnessing a massive wave of innovation being led by a start-ups revolution and strong, growing community of IT technologists.

Start-ups and developers are now using location technology as a core asset for solving some of the most challenging problems we as a country, citizens or businesses are facing today. Whether it is real-estate, retail, smart cities, or multi-modal transportation, GIS technology is powering most of the applications which are now becoming a new benchmark across the globe.

Esri has always been on the forefront of technology evolution leading the innovations in GIS technology and making it more open and extendible. Over the years ArcGIS technology has evolved into a platform which is making GIS available anytime, anywhere on any device. GIS technology is now easy to use, and is making significant inroads beyond core GIS users. Most of the functionalities can now be achieved via configuration of the platform providing a faster time to market. At the same time, Esri has also evolved the customization capabilities of the platform making it easier for developers to extend and rapidly develop new and innovative solutions and applications. Esri provides an extensive collection of rich, ready-to-use, industry ready APIs and SDKs on all popular development platforms. Also, new app builders such as AppStudio enable developers to build mobile applications rapidly, independent of the development platform.

In this issue of ArcIndia News, we share how the capabilities of ArcGIS platform can be extended. We present to you a collection of articles, capabilities, applications and case studies which would be useful for specialized as well as new GIS users to understand how to leverage ArcGIS as a development platform and power your solutions with GIS.

Agendra Kumar



# Content

## 05 — NEWS

- The ArcGIS Book: 10 Big Ideas about Applying Geography to Your World
- Esri Unveils ArcGIS Earth to the World
- Esri Collaborates with Microsoft to Incorporate Location Services and Spatial Analytics
- Esri's ArcGIS to Support SAP HANA as Enterprise Geodatabase, Deepening Integration Across Products
- Esri India launches 'mApp Your Way 2016'
- Esri Takes Top Award for Internet of Things Innovation
- Esri India receives Technoviti Award for Enterprise GIS platform for BFSI

## 10 — PRODUCT REVIEW

- AppStudio for ArcGIS: A New Platform for Building Native Apps
- No Programming Required - Create web apps rapidly with Web AppBuilder for ArcGIS
- Esri Apps – Making ArcGIS Available Everywhere
- Portal for ArcGIS

## 22 — COVER STORY

- ArcGIS and Developers

## 27 — TECHNICAL ARTICLE

- ArcGIS and Open
- The ArcGIS Platform: An Architecture Overview
- Bringing the R and ArcGIS Communities Together

## 32 — EVENT COVERAGE

- Esri India User Conference 2015

## 36 — BEST PRACTICES

- Getting the Results You Want from GIS
- Choosing the Right Development Platform
- Discover 5 Ways to Get the Most Out of Your GIS Platform

## 42 — CASE STUDY

- Vision to Reality: How Reliance Jio used GIS to build India's largest 4G Network

## 46 — APPLICATION ARTICLE

- Electoral Data Analysis & Management – Asman Soft
- Smart City Management Solution – Vayam Tech
- A Fresh Take on Addressing – What3Words

## 51 — TIPS & TRICKS

- Disconnected Editing with Collector for ArcGIS
- Add Tweets to Your Web Map

## 54 — GIS TRIVIA

- Esri's Geotrigger Service - The Future of Geofencing



# The ArcGIS Book

10 Big Ideas about Applying Geography to Your World

Consumer mapping has opened the eyes of the world, and especially decision makers, to the value of maps and geography and consequently increased the demand for the critical information and insights generated by GIS. This phenomenon is also transforming the role of GIS practitioners. Today, they need to better understand their organization's business objectives so they can contribute in an even more meaningful way to its success. ArcGIS is a complete system for discovering, creating, consuming, and sharing geographic data, maps, and apps. It is a true Web GIS. Web GIS is fundamentally changing how information about the world around us is applied and shared to enable all of us to make the best decisions possible. Whether you're a seasoned GIS practitioner or a newcomer to the field, you have a new way to experience Web GIS for yourself. This is the promise of The ArcGIS Book.

The ArcGIS Book explores Web GIS in ten chapters, each focused on one big idea. You will learn how to do new things with GIS and accomplish familiar tasks more quickly and easily. For inspiration on what you can do with Web GIS, the book includes links to hundreds of live examples of web maps and apps as well as videos of thought

leaders sharing their vision for what you can accomplish by adopting the Web GIS concepts.

In addition to inspiring you, The ArcGIS Book will give you hands-on practice with making a story map, conducting spatial analysis, editing geographic data, building a 3D model, and much more.

Here are the ten big ideas explored in the book:

- Maps, the Web, and You: Power and possibility with Web GIS
- Cartography is for Everyone: New ways to make, see, and use maps
- Tell Your Story Using a Map: Inform, engage, and inspire people with story maps
- Great Maps Need Great Data: Creating and using authoritative geographic data
- The Importance of Where: How spatial analysis leads to insight
- Mapping the Third Dimension: A change in perspective
- The Power of Apps: Focused tools that get work done
- Your Mobile GIS: The GIS of the whole world plus a live data sensor in your pocket
- Real-Time Dashboards: Integrating live data feeds for managing operations
- GIS is Social: Web GIS is the GIS of the world

The ArcGIS Book is available in print, as a downloadable pdf, and as an interactive website. See it come alive at [www.TheArcGISBook.com](http://www.TheArcGISBook.com). ♦

## Esri Unveils ArcGIS Earth to the World



Esri, the world leader in mapping technology, has launched ArcGIS Earth, a free, desktop-based interactive globe that anyone can use to explore the world and work with a variety of 3D and 2D map data formats including KML. ArcGIS Earth allows users to quickly display data on the globe, sketch place marks, measure distances and areas, and add annotations to easily understand spatial information.

"ArcGIS Earth is a revolutionary desktop application that offers GIS to the world," said Jack Dangermond, Esri founder and president. "It supports spatial data formats and workflows that are familiar to your enterprise. It is a core component of Esri's secure, stable, and mature ArcGIS platform, and it's another tool for serving all your internal and external users through GIS."

Demand for 3D mapping continues to grow among Esri customers in industries as diverse as national and local government, urban design and planning, and commercial space management. These customers are using 3D to visualize plans and conditions, understand the behavior and aesthetics of proposed development, and communicate ideas in the context of real-world imagery and data. ArcGIS Earth allows users to examine interrelationships of assets in 3D, report project status, and present work to stakeholders or clients in a compelling and interactive experience.

ArcGIS Earth is designed to provide a high-performance globe viewer with an immersive user interface.

ArcGIS Earth users can explore open standard KML and KMZ data, shapefiles, imagery, and web services; tilt and rotate the view; measure distances and areas on the globe; and supplement maps with sketches and annotations. ArcGIS Earth includes free content that encompasses global imagery, topographic maps, world ocean maps, OpenStreetMap, and publicly available maps shared by millions of ArcGIS users around the world.

“Enterprise customers can use ArcGIS Earth to put the power of mapping into the hands of anyone in a large organization who needs to reliably access a map,” said Chris Andrews, Esri product manager for ArcGIS Earth. “The application combines a familiar, immersive, globe-based experience that is accessible by nontechnical users, with the power to access any data stored in the ArcGIS platform. With ArcGIS Earth, we are adding an option to help our users share the value of GIS throughout their organizations or even beyond.”

ArcGIS Earth is fully integrated with the ArcGIS platform—on-premises and in the cloud—for the secure access, sharing, and publishing of enterprise maps and data, and continued operations with minimal interruption. Users with an ArcGIS account can access secured data in ArcGIS Online or ArcGIS for Server including feature, scene, map, and image services.

ArcGIS Earth is also part of Esri’s offer for Google customers and partners looking to transition to Esri software following the deprecation of Google Earth Enterprise. Along with other capabilities of the ArcGIS platform, ArcGIS Earth provides an alternative to Google Earth Enterprise Client.



## Esri Collaborates with Microsoft to Incorporate Location Services and Spatial Analytics

The Internet of Things (IoT) inspires new ways of thinking about how we work with and share information. And now enterprises are getting ready to intelligently consume IoT’s large data streams in real time. To help with this, Esri Inc. is working with Microsoft Corporation to integrate location services and spatial analytics to the Microsoft Azure IoT Suite.

“Location is fundamental to realizing value in being connected,” said Chris Cappelli, Global Business Development, Esri.

“There can be no IoT without understanding the physical and spatial context of the machines it consists of. The common language of geography unlocks the value in IoT data streams.”

The Esri and Microsoft collaboration will rapidly enable IoT scenarios by offering customers and partners a set of highly capable platform services as ready-to-use, preconfigured solutions. This forthcoming integrated offering is the next step in Microsoft’s and Esri’s long-standing alliance to spatially enable the enterprise.

Smart city concepts and innovations in the automotive industry are examples of how data from many sources increases understanding. Governments and businesses use that data to improve safety features, reduce air pollution, and mitigate traffic congestion.

“The Azure IoT Suite enables customers to rapidly deploy pre-configured solutions that scale to millions of devices and help them realize business value from IoT,” said Sam George, partner director of Azure Internet of Things, Microsoft. “Our collaboration with Esri will extend the Azure IoT Suite to include rich location and geo-spatial services, which are critical in the world of IoT.”

Esri and Microsoft look forward to building on their collaboration to deliver IoT offerings as the market advances. ♦

## Esri’s ArcGIS to Support SAP HANA as Enterprise Geodatabase, Deepening Integration Across Products

SAP announced that through a global technology partnership, Esri will commercially support ArcGIS using SAP HANA as an enterprise geodatabase.

This release of ArcGIS, planned for 2016, expands the existing native integration with SAP HANA and allows customers to run all their SAP Business Suite and ArcGIS applications within an architecture based on SAP HANA. The companies will further enhance the SAP HANA platform by more deeply integrating advanced ArcGIS geospatial capabilities and content across SAP’s broader application portfolio. The collaboration between SAP

and Esri is expected to harness the power of combining two market-leading platforms, providing the ability to run both GIS workloads and advanced spatial analytics on a single SAP HANA geodatabase. Customers will be able to apply sophisticated business rules and relationships to spatial data directly in SAP HANA, define advanced georelational models such as topologies and networks, and permit both GIS and enterprise business users to work within the same multiuser access and editing environment. In addition, the planned integration will result in massive parallelization of computationally intense workloads, all in memory, enabling new solutions that could not previously be delivered.

"We're very excited about the enterprise geodatabase support for SAP HANA," said Jack Dangermond, president, Esri. "It will bring our customers speed, simplicity and better integration with their enterprise information. For SAP customers, it delivers a complete platform for mapping and geospatial intelligence. By synchronizing our platforms, our respective customers will benefit across the enterprise. We're doing the work to make sure that GIS and mapping is available to all — not just traditional mapping experts."

SAP and Esri have been technology partners for a number of years, providing integration of their respective platforms, SAP HANA and Esri ArcGIS. Companies

invested in Esri and SAP can immediately create maps populated with data from SAP HANA and instantly access those maps anywhere on any ArcGIS client, as well as in SAP or custom applications. Today users of SAP HANA can access ArcGIS for geospatial data and geoservices and perform analytics, while Esri users can similarly access, analyze and query both spatial and nonspatial data directly in SAP HANA. Esri supports deployments of SAP HANA with query layers and features services for customers that want to dramatically increase spatial query performance by running SAP HANA side by side with ArcGIS.

"Our customers represent a new generation of data stewards requiring an in-memory computing platform that performs at scales unseen before — including large-scale geography," said Daniel Schneiss, senior vice president and global head, SAP HANA Platform and Databases, SAP. "As we enter a world of exponential data growth and the Internet of Things, the need to geospatially analyze Big Data will only increase from this point forward. We look forward to teaming with Esri to address this need by integrating the full power of ArcGIS technology with SAP HANA."

For more information on SAP and Esri, visit [www.esri.com/saphana](http://www.esri.com/saphana) ◆



With a view to provide a platform to the institutes and students to showcase their skills and capabilities in the GIS technology, a Geographic Information System (GIS) Software & Solutions provider, Esri India, has announced the second edition of 'mApp Your Way 2016', an App Development Challenge.

All the students (UG/PG/Research scholars) associated with the institutions that are users of Geospatial / ArcGIS technology can participate in this event.

Agendra Kumar, President, Esri India said, "GIS technology now plays an important role in all walks of life. Through this initiative, Esri India will familiarize students with GIS technology and help them understand its benefits better".

Surya Durbha, Associate Professor, Centre of Studies in Resources Engineering, IIT Bombay said, "It is good to see the growing interest in the academia about the impact of GIS technology on a variety of challenging real world applications. The mApp Your Way challenge provides a great opportunity for the youth of India to create solutions that would help in dealing with some key societal issues."

Participating teams will be given four months to develop the app on Esri's ArcGIS platform on themes spanning across education, health, retail, transport, energy and environment and government projects. These apps will then be judged on the uniqueness of the problem statement, innovation, citizen impact, usefulness and ability to be scaled for larger use. ◆



# Esri Takes Top Award for Internet of Things Innovation

Esri, the leader in geospatial technology, was honored at the TM Forum Catalyst InFocus event for the company's contributions to developing solutions for a more connected world. TM Forum, a global industry association for digital business, presented Esri and partners with the Most Innovative Catalyst Award.

"We're driving toward the ultimate Internet of Things (IoT) ecosystem where you can bring different applications together that are going to make our lives safer, more energy efficient, and much better in the future," said Randy Frantz, telecommunications solutions director at Esri.

Esri's telecommunications team collaborated with Orange and BearingPoint on the award-winning proof-of-concept project called the Smart Energy Catalyst. The project showcased how a smart home, smart electric vehicle, and smart energy system can work together in an IoT ecosystem with location as a key interaction point.

The multiphase project examined the infrastructure necessary to support a smart energy ecosystem. With the latest iteration of the Catalyst, the project team demonstrated how geofencing in homes and cars can work with Esri's geographic information system (GIS) technology. When the consumer leaves home or work, mobile devices trigger the GIS to initiate a series of notifications and actions. For example, lights in homes automatically turn off, security systems are enabled, and users are notified that their electric vehicle needs charging.

"Location provides context to the IoT network. It transforms raw sensor data into useful, actionable information," Frantz said.

TM Forum's Strategy Committee gave the award to the Smart Energy Catalyst team based on several criteria, including having a compelling and inspiring demonstration; growth potential and business value; and potential for humanitarian or other positive effects on society.

Nearly 200 industry leaders attended the Catalyst InFocus conference, where they explored the organization's 11

project demonstrations.

TM Forum's Catalyst program connects diverse companies from across industries, facilitating collaboration and fostering the cocreation of innovative solutions to pressing telecommunications business challenges. Catalysts are member-led projects and demonstrations that both inform and leverage TM Forum best practices and standards including TM Forum Framework.

The organization announces Catalyst Awards biannually. Winning teams leverage proven technologies, competencies, and investments. Teams have six months to develop proofs of concept that outline digital solutions.

In addition to his work on the Smart Energy Catalyst, Frantz accepted a position earlier this year as colead of TM Forum's IoT work stream. The endeavor explores how location, advanced sensor and device data, and powerful industrial and consumer solutions can change social norms and bring business into the modern technology framework. TM Forum includes more than 900 member organizations and 85,000 individual members.

Learn more about Esri solutions for telecommunications at [esri.com/telecom](https://esri.com/telecom). 





# Esri India receives Technoviti Award for Enterprise GIS platform for BFSI

Esri India, country's leading Geographic Information System (GIS) Software & Solutions provider has been conferred with 'Enterprise GIS platform for BFSI' award in the Technoviti Awards 2016, financial services technology innovation awards.

The award is a result of a rigorous process where a jury of 28 leading CXO's and consultants of BFSI industry evaluated and judged the technology innovations. Some of the distinguished jury members included Sunder Krishnan, Chief Risk Officer, Reliance Life Insurance, Sameer Jaini, CTO, DCB Bank, M.K. Madhavan, CTO, IndusInd Bank and Dennis Thomas, KPMG.

The 23 most promising innovations were honoured with Technoviti Awards based on innovation and benefits to the stakeholders.

At its core, BFSI is a location based business. Location data is pervasive across all departments. By understanding the

location of customers and their transactions, a bank can better manage its branch networks and merchants and understand the competition and regulators. It helps banks to reach out to distant customer, decongest a branch, take right decisions in terms of branch and ATM placement, enables market comparison vis-a-vis performance, plan rural marketing better. It is helping insurance organisations in collection tracking, claim monitoring, and risk assessments.

Enterprise GIS from Esri India is a mapping platform for the organisations for organising & managing the geographic context of their assets and resources. It is used for creating and using maps; compiling geographic data; analyzing mapped information; sharing and discovering geographic information; using maps and geographic information in a range of applications; and managing geographic information in a database. The system provides an infrastructure for making maps and geographic information available throughout an organization, across a community, and openly on the Web. The Platform is designed to run infrastructure, either on-premises or in virtualized environments. It can be configured to work within the existing IT infrastructure and integrate with the enterprise security systems. Technoviti is a unique platform that helps the BFSI fraternity to understand the technology innovations that would be future game changers. This year's theme was "Technoviti 2016 – Futurecrafting Business with Technorptions". ♦





# AppStudio for ArcGIS: A New Platform for Building Native Apps

ArcGIS users can now easily build native apps that run on any device using AppStudio for ArcGIS, a groundbreaking tool from Esri.

Build an app once, and it runs on Android, iOS, Windows, OS X, and Linux devices.

Existing ArcGIS users can convert their maps directly into native apps that are ready to use.

These beautiful, simple native GIS apps can be shared with the public through all popular app stores or securely within an enterprise.

## Expand Your Reach

Companies and organizations—particularly cities and local governments—need to broaden their reach and engage community members with useful content to promote the good work they do.

What if, for example, there was an easy way for residents to report streetlights that have gone out, share and view popular dining spots, or find mountain biking trail maps? To make these things accessible, organizations need to expand their web presence into the Google Play, Apple, and Microsoft app stores.

This can be challenging in the face of tight timelines, restricted budgets, and scarcity of GIS developer resources.

AppStudio provides a cost-effective way to create and distribute apps to the public. Organizations can leverage their existing GIS work and exploit the developer capacities they already have. AppStudio was designed to enable anyone with GIS skills to configure out-of-the-box templates; no coding is required.



That said, if an organization wants to take a deeper dive with developer tools to customize apps or build them from scratch, AppStudio comes with an integrated development environment and provides the source code for its templates, which developers can use as a starting point.



Your Apps Everywhere, on Any Device GIS managers under pressure to deliver GIS apps and data quickly can use AppStudio to let their departments focus on what's important—sharing their work—rather than worrying about app development.

Whereas GIS departments previously had to build a separate app for each platform they supported—one for iOS, one for Android, and one for Windows—they can now build one app for all platforms. After using a step-by-step app building wizard, users check a box for each platform they want the app to run on. AppStudio then automatically generates the installation files for each of the selected platforms.

Organizations also have the option to share apps internally only. While this enables GIS departments to limit app distribution altogether, it is also a way for them to do centralized testing or debugging before sharing new apps more widely.

## Great for Developers


AppStudio makes GIS developers much more efficient. Being able to produce apps that function across multiple

devices is useful now that more and more organizations are letting employees bring their own devices to the workplace.

Additionally, AppStudio gives developers options for customization. They can either dig into the templates that come with the tool or start coding from scratch. Developers can also include advanced GIS functionality by bringing into play device hardware such as graphics processing units (GPUs), RAM, cameras, microphones, and accelerometers.

## Gain Power over Constraints

AppStudio gives power back to GIS organizations. No longer constrained by having to create five separate apps for five different devices, organizations can now build apps as quickly and as customized as they wish and share them as widely—internally or externally—as they want.

By allowing organizations to further leverage their investments in ArcGIS, AppStudio lets even more people benefit from the valuable work being done by GIS departments—on any device. 

# No Programming Required

## Create web apps rapidly with Web AppBuilder for ArcGIS

Do you want to build web mapping applications you can run on desktop, web, or mobile platforms without doing any programming? Then all you need is an ArcGIS Online or Portal for ArcGIS account.

ArcGIS Online and Portal for ArcGIS now include Web AppBuilder for ArcGIS, which lets you create custom web mapping applications in a what you see is what you get (WYSIWYG) wizard environment that is intuitive and easy to use. Web AppBuilder for ArcGIS is built on ArcGIS API for JavaScript and HTML5, enabling you to create apps that can run on any device.



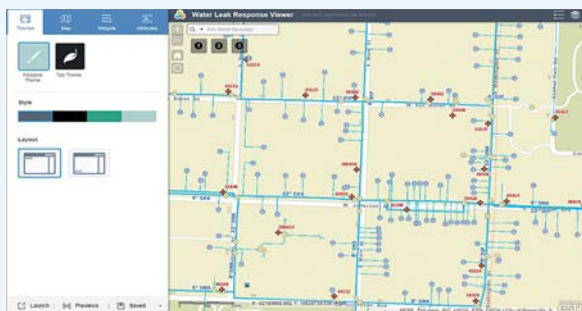
This article shows how to create a web mapping application based on a web map in ArcGIS Online or Portal for ArcGIS in just six steps without having to write a single line of code.

## 1 Select a web map and activate Web AppBuilder for ArcGIS

Log in to your ArcGIS Online (or Portal for ArcGIS) account. Navigate to your My Content page and select a web map that you want to use in your web app. Open it in the map viewer. Click Share. In the Share dialog, select the group or groups you want to share the web map with, and then click Make a Web Application.

In the Make a Web Application dialog, you will see that you could create a web app using the Web Application templates. But in this case, click the Web AppBuilder tab to create a new web app in Web AppBuilder for ArcGIS.





On the Web AppBuilder tab, provide a title, appropriate tags, and a summary description of the web app you will create for your selected web map. Then click Get Started. This will activate the Web AppBuilder for ArcGIS “builder” application.

Note that while you are still in either ArcGIS Online or Portal for ArcGIS, you are now working in the Web AppBuilder for ArcGIS application within those sites. Alternatively, you could have also activated Web AppBuilder for ArcGIS directly from the My Content page by clicking Create > App > Use the Web AppBuilder.

The Web AppBuilder for ArcGIS application layout is divided into two general sections. To the left are the different parameter settings you can enable and configure for your new web app. To the right is a live, WYSIWYG preview of how the web app will appear after you have configured parameters for the web app.

Notice that the left section of the layout contains four tabs: Themes, Map, Widgets, and Attributes. These are the main areas where you can configure and customize your new web app. Both the Themes and Attributes tabs are for defining the look and feel of the web app.

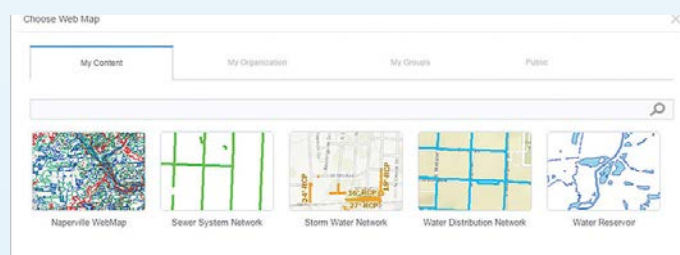
The Map tab defines the data content of the web app—in this case, it is the web map you selected. The Widgets tab allows you to set and configure the functionality in the new web app. When you make a change in the left section in one of the four tabs, it will be immediately visible (if applicable) and enabled in the right display preview section of Web AppBuilder for ArcGIS. This provides a very intuitive and user-friendly experience so you can see and try out the changes you just set for the web app. For example, if you were to add a new widget button to the app interface, it would appear in the app layout.

## 2 Configure the look and feel of your web app

Click the Themes tab. There are two default themes available: Foldable and Tab. First, click the Tab Theme button. You will notice that the app’s layout changes in the preview window on the right. Then click the Foldable Theme button. You will see that the app layout returns

to the way it was. Note that each option also has its own unique style and layout options. Select a theme for your new web app along with a style and layout and then click Save in the lower part of the left section.

Next, Click the Attributes tab. On this tab, you can further refine the appearance of your web app. You can add a custom logo, title, and optional subtitle and web links for your web app. Add an appropriate title for your web app; click the Logo button to add your own custom logo; and add a subtitle and web links, if desired. Click Save when you are finished with your custom settings.



## 3 Customize the map display of your web app

Click the Map tab. On this tab, you can change the data content for your new web app by simply clicking the Choose Web Map button. In the Choose Web Map dialog, you will see all the web maps in My Content of your ArcGIS Online (or Portal for ArcGIS) account. You can also view the web maps that you can access in your organization, the groups you belong to, and public web maps. But you will use the web map you originally selected for this new web app; therefore, click Cancel.

You can navigate and change the spatial extent of the current map display in the right-hand section of Web AppBuilder for ArcGIS. Zoom to the spatial extent that you want your new web app to show when the app starts up and click the Use Current Map View button. Click Save when you are finished.

## 4 Configure your web app’s functionality

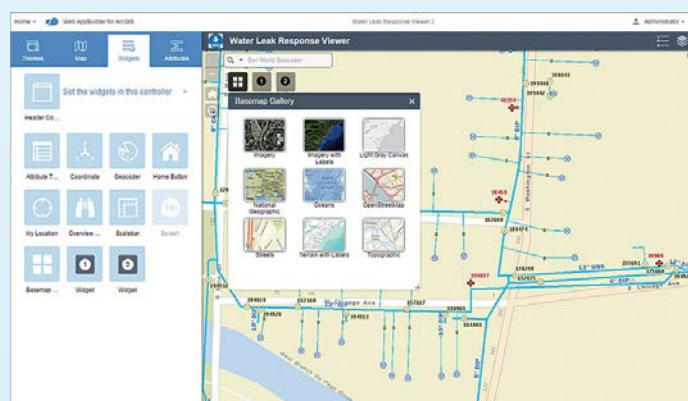
Define the different capabilities available in your new web app. Click the Widgets tab. This tab lists the different functionalities that you can add to your new web app. A widget is a chunk of code that enables functionality in web apps. By selecting and adding widgets, you enable different functionalities in the app.

A best practice is to create web apps that meet a specific business workflow instead of generic apps that address multiple workflows.

For example, you should create an app for editing parcels and a different one for collecting data from the field, instead of a single app that would do both.

The Widgets tab lists several widgets that form part of the user interface (UI) of your new web app. Hover your cursor over a widget such as Geocoder. Notice that the widget becomes highlighted in red in the app preview display. Some widgets in the list appear in light blue, indicating that they are not activated, and therefore, not part of your app. To disable a widget, hover over the upper-right corner of the widget icon and click when an eye icon appears to hide it. To configure a widget's specific properties, hover over the lower-right corner of the widget icon and click the pencil icon when it appears. At the bottom are three generic widget icons denoted by the numbers 1, 2, and 3. These are currently empty placeholders that enable you to add more widgets to the web app UI, if desired.

Click Widget 1 on the Widgets tab to make the Choose Widget dialog appear. In this dialog, you can select the widget you want to add. Select the Basemap Gallery widget



and click OK. Next, the widget's configuration properties dialog appears—this is where you can further define the properties of the widget. Select the basemaps you want available and click OK to save your widget settings. The Basemap widget now appears in the app preview display. Click the Basemap widget in the preview window to see how it would work in the web app.

If you need to add more widgets to the app, you can click the Header Controller widget at the top of the Widgets tab. It contains widgets in the app title bar. Web AppBuilder for ArcGIS includes more than 20 widgets. More widgets are added with each new ArcGIS Online and Portal for ArcGIS update. The widgets initially offered provide core functionalities typically found in GIS applications and are listed in Table 1. The complete list of available widgets and information on configuring widgets is available from the ArcGIS Online help.

Select and add the widgets that would be appropriate for your new web app. Click Save when you are finished.

You have now completed setting the appearance, data content, and functionality of your new web app. Your custom web app is complete and ready to use.

## 5 Save and launch your web app

Your new web app is saved in My Content. The web app becomes a new item and can be edited within the Web AppBuilder for ArcGIS builder environment at any time. It is now live and can be accessed by anyone you have shared it with. Click Launch at the bottom of the left-hand section to run your newly created web app in the web browser.

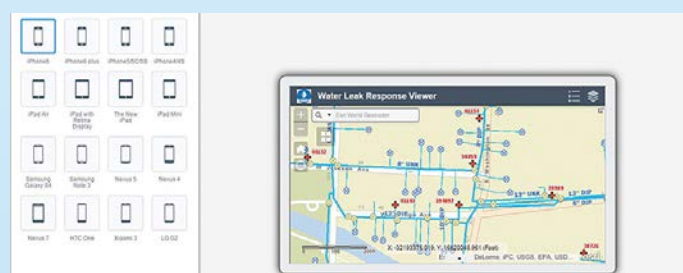


## 6 See how your web app will appear on different devices

Because Web AppBuilder for ArcGIS is built on ArcGIS API for JavaScript and HTML5, the new app can run on any web browser on any device. The Web AppBuilder for ArcGIS user interface provides an environment that enables you to preview how the web app will look on these different platforms.

At the bottom of the left-hand section, click the Previews button. This changes the entire Web AppBuilder for ArcGIS display interface. On the left, a list of mobile devices is shown, and on the right is a preview of how the new web app will look in the selected device. Click Configure to return to the previous Web AppBuilder for ArcGIS interface when you are done.

See how easy it was to create, configure, and launch a custom web mapping application in Web AppBuilder for ArcGIS? Web AppBuilder for ArcGIS is also extensible, meaning you can create your own widgets and themes using the Web AppBuilder for ArcGIS Developer Edition and with ArcGIS API for JavaScript. 🌟





One of the things that is making ArcGIS come alive is apps. Apps are opening it up, making it available to everybody in your organization, including the public. Esri has three main areas that they are working on: field apps, office apps, and apps for citizen or public engagement.

Esri offers ready-to-use apps that let you share the content you create in ArcGIS with users across your organization, from professional analysts to business users to field personnel. ArcGIS apps are designed to help you analyze information, make decisions, monitor your operations, gather and edit data in the field, and share information with anyone who needs it. You can access these apps over the web, on mobile devices, or in your business systems.

All the apps are connected to each other by means of workflows. Because they are all connected, the users are guided to the right app based on their task. They are not bothered with functionality they do not need, and based on where they are in the workflow, they are sent to the right app automatically.

Esri has apps categorized around three main areas: field apps, office apps, and apps for citizen or public engagement.

## Apps for Field

ArcGIS mobile apps help you view, collect, and edit data in the field. You can use these apps to record field surveys, map edits, and other information captured by a wide range of mobile devices. Field collection apps include:

- **Collector for ArcGIS** is a smartphone and tablet app that lets you collect and update information in the field. You can even edit data when you have limited or no connectivity.

- **Survey123 for ArcGIS** is a simple and intuitive form-centric data gathering solution for creating, sharing and analyzing surveys in three easy steps. You can create smart forms with skip logic, defaults, support for multiple languages, and much more. Field workers with mobile devices can use the app to capture data in any environment, with minimal training. The data can be quickly analyze the results to make actionable decisions. As the app is fully integrated with the ArcGIS platform, you can gather data in the field on any device, even when disconnected, and securely sync it to ArcGIS for further analysis.



*Survey123 for ArcGIS is a simple and intuitive form-centric data gathering solution that makes creating, sharing, and analyzing surveys*

- **Navigator for ArcGIS** is a mobile app that helps you unlock efficiency and improve reliability of your field workforce. You can use the data provided or your own data to search and navigate directly to your organization's assets. The app can interact seamlessly with Collector for ArcGIS and other apps, and get reliable directions even when disconnected.



- **Workforce for ArcGIS** is a mobile app that uses the power of location to achieve better coordination and teamwork in your field workforce. It reduces reliance on paper and ensures everyone uses the same authoritative data, reducing errors, boosting productivity, and saving money. Back-office staff use Workforce in the web browser to assign work, monitor progress, and see where workers are in real time. Field workers use the Workforce mobile app to receive assignments and communicate status. Workforce is part of a suite of ArcGIS apps that enable organizations to maximize efficiency in their field workforces.
- **Operations Dashboard for ArcGIS** helps you monitor activities and events, track your field work force, and assess the status and performance of your daily operations. You can access your operation views from a web browser to keep track of your organization no matter where you are.
- **Esri Maps for SharePoint** allows you to quickly create dynamic, interactive maps of your SharePoint data and uncover patterns and trends not evident from tables and charts. You can connect these maps to other SharePoint web parts and share them with internal staff or the public.
- **Esri Maps for Dynamics CRM** integrates ArcGIS maps and data visualization with Dynamics CRM. When you incorporate location in your customer management system, you can improve promotion targeting, better understand your sales territories, and build more effective relationships with your customers.
- **Esri Maps for IBM Cognos** lets you add ArcGIS maps and data visualization to IBM Cognos. You can enhance your reports with interactive maps, take advantage of geoenriched data to solve problems, and share your results using web maps for your dashboard.
- **Esri Maps for MicroStrategy** brings ArcGIS maps and data visualization to your MicroStrategy reports and dashboards. You can filter data to spot trends and patterns and add customized maps to your reports to keep decision makers informed.

## Apps for the Office

ArcGIS Office apps give you a way to view and analyze the factors that influence your decisions. You can use these apps to analyze business variables, plan projects, and target policies and resources to make a positive impact in your community. These include:

- **Esri Maps for Office** lets you quickly create dynamic, interactive maps inside your Excel spreadsheets, and enrich your spreadsheet data with ready-to-use demographics and lifestyle data. You can use these maps in PowerPoint presentations—both as static map images and fully interactive maps—and share them with internal staff or the public.
- **Esri Maps for Salesforce** incorporates ArcGIS maps and data in your Salesforce customer relationship management tools. You can geoenrich your business information with demographics, consumer spending, and lifestyle data to better understand your customers and sales territories.
- **Esri Maps for SAP BusinessObjects** integrates ArcGIS maps and data with the SAP BusinessObjects environment. You can incorporate interactive maps and location-based tools in your everyday workflows to gain new insights from business and social data.
- **ArcGIS Maps for Adobe Creative Cloud** enables design and communications professionals to access millions of data-driven maps inside Adobe's design apps. You can quickly find geographic content and add them to your work as editable vector layers or high-resolution images.
- **ArcGIS Pro** is the premier app for creating maps and geographic data on the desktop. It is a fast, 64-bit desktop application that lets you design, edit, and process data in 2D and 3D. ArcGIS Pro is designed to work with multiple displays and layouts, and lets you publish finished web maps directly to ArcGIS Online or Portal for ArcGIS.
- **GeoPlanner for ArcGIS** is a web application that helps you evaluate land-use and development scenarios so you can make more informed planning decisions. You can use GeoPlanner for ArcGIS to collaborate on planning projects, run comparative analysis, and create project reports.



*Map your Excel data and work with maps in many new ways*

- **Esri Business Analyst Online** is a web application that provides detailed information about businesses, consumers, lifestyles, and buying behaviors in your market area. With Business Analyst Online, you can perform site selection, analyze competitive factors, and target customers.
- **ArcGIS Earth** is a free, desktop-based interactive globe that anyone can use to explore the world and work with a variety of 3D and 2D map data formats including KML. ArcGIS Earth allows users to quickly display data on the globe, sketch place marks, measure distances and areas, and add annotations to easily understand spatial information.




*ArcGIS Earth allows users to quickly display data on the globe, sketch place marks, measure distances and areas, and add annotations to easily understand spatial information.*

- **Esri Community Analyst** is a web application that provides detailed information about demographics, health, crime, and businesses in your community. With Community Analyst, you can identify community needs, refine policy decisions, and allocate resources more effectively.
- **Explorer for ArcGIS** is a simple, responsive app that makes it easy for anyone to consume ArcGIS content. You can use Explorer for ArcGIS to search for data, access maps, and create presentations for your stakeholders.
- **Drone2Map for ArcGIS** is a desktop app that turns raw still imagery from drones into orthomosaics, 3D meshes, tile images, and more, in ArcGIS. You can create 2D and 3D maps of hard-to-access features and areas.

## Apps for Community

ArcGIS also includes apps that let you discover, visualize, and share maps and other data quickly and easily. Sharing and visualization apps include:

- **ArcGIS Open Data** allows organizations to provide open access to their authoritative data through open data websites. The general public can use open data sites to search for data by topic or location, view data on an interactive web map and in a table, or download data in multiple formats.
- **Story Maps** combine interactive maps and multimedia content into elegant user experiences. They make it easy for you to harness the power of maps to tell your stories. ArcGIS comes with more than a dozen predefined story map templates that highlight places, points of interest, map series, comparisons between maps, and more.
- **Crowdsense Reporter** application can be used to report a problem or observation. Users can anonymously submit new reports, review existing reports, and comment and vote on reports or observations submitted by other users. They also can authenticate with their social media or ArcGIS Online credentials and track the status of problems or observations they have reported.
- **Crowdsense Manager** application can be used to review problems or observations reported. Users authenticate with their ArcGIS credentials and look for patterns and clusters, review problem details, update status, and assign responsibility.
- **Crowdsense Polling** application can be used to gauge sentiment on specific plans or proposals. Users can anonymously submit new comments and/or vote on the importance of the plan or proposal. They also can authenticate with their social media credentials and have an open dialog with other members of the community.
- **Photo Survey** leverages location-enabled photos produced by many commercially available cameras and simplifies data processing so street-level photo collections can be gathered on a regular basis. Photo collections can then be combined with relevant survey questions in an ArcGIS Online map, and shared with the Photo Survey application. Once complete, the Photo Survey application can be used by the general public and/or local government staff to review street-level photos and complete property surveys.
- **Quick Report Template** can be used to create a citizen engagement native app that allows users to capture an observation and submit it to an online service. 

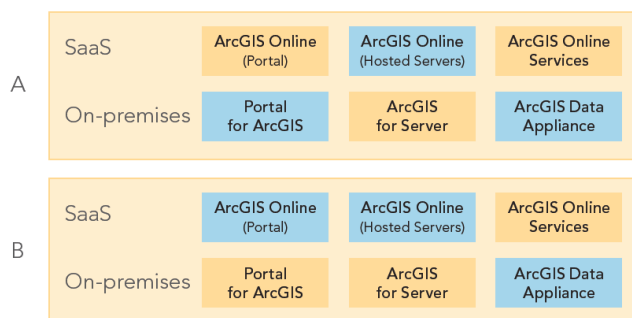
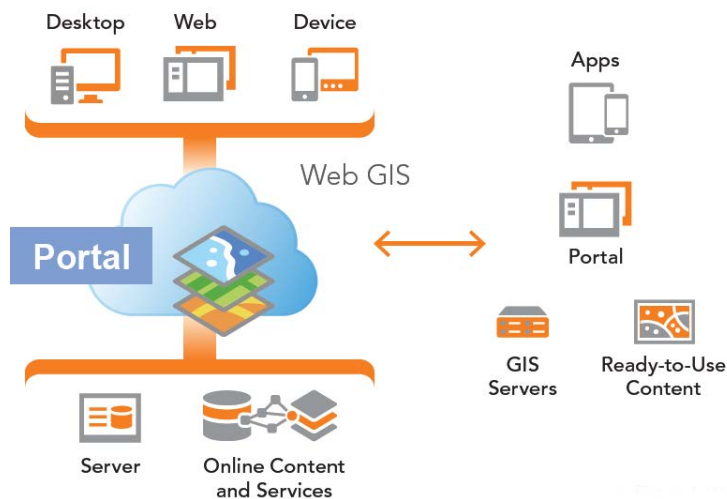
# Portal for ArcGIS

This article provides GIS managers and analysts with an understanding of the fundamental concepts of Portal for ArcGIS and its capabilities. It presents a general overview of Portal for ArcGIS; discusses its key features, architecture, and implementation; and highlights the ArcGIS platform client applications that are available with Portal for ArcGIS.

Traditionally, GIS has been a technology used by analysts to perform spatial analysis and generate custom map products that meet the specific needs of their organizations. Although it was considered a niche technology, in recent years the concept and importance of spatial location have become more mainstream, and GIS awareness is now becoming more prominent in many organizations. Web GIS is a pattern for delivering GIS capabilities. It is at the center of Esri's strategic direction for implementing GIS as a platform. The key concept behind web GIS is that all members of an organization can easily access and use geographic information within a collaborative environment. Analysts still provide technical GIS expertise in the traditional sense, but other staff in the organization with little or no GIS knowledge can also benefit from and contribute to the organization's GIS platform. Web GIS leverages existing GIS investments and makes them discoverable and more accessible. It provides a platform for integrating GIS with other business systems and promotes cross-organizational collaboration. Consequently, web GIS extends the reach of GIS to everyone in an organization, enabling better decision making.

At the center of the web GIS pattern in the ArcGIS platform is the generic concept of a portal that represents a gateway for accessing all spatial products in an organization. The portal helps organize, secure, and facilitate access to geographic information products.

Client applications on desktops, web apps, tablets, and smartphones interact with the portal to search, discover, and access maps and other spatial content. In the back-office infrastructure, the portal is powered by two components: GIS servers and ready-to-use content.

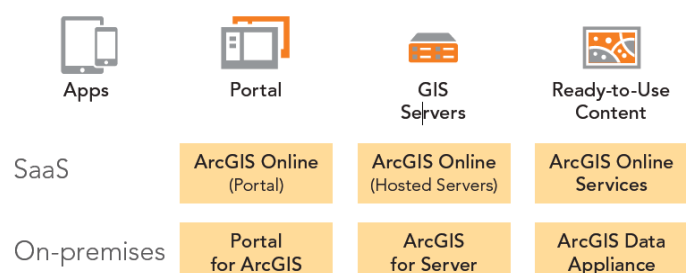


other spatial content. In the back-office infrastructure, the portal is powered by two components: GIS servers and ready-to-use content.

The ArcGIS platform offers two deployment models for web GIS. ArcGIS Online, the cloud-based offering, has a software-as-a-service (SaaS) deployment model. All components are hosted in the cloud. There is no hardware infrastructure for an organization to maintain because Esri manages and maintains ArcGIS Online.

Alternatively, there is an on-premises model that includes Portal for ArcGIS. Portal for ArcGIS is deployed with ArcGIS for Server and optionally with the ArcGIS Data Appliance. In the on-premises model, an organization manages the hardware infrastructure to operate the ArcGIS platform.

Although there are two separate web GIS deployment models, hybrid deployments that combine parts of the cloud-based model with parts of the on-premises model are not only possible but very popular. These two common hybrid deployments are: ArcGIS Online + ArcGIS for Server + ArcGIS Online content and Portal for ArcGIS + ArcGIS for Server + ArcGIS Online content. Selecting the appropriate web GIS deployment model—SaaS, on-premises, or a hybrid variation—will depend on an organization's business workflows and security requirements. Organizations can use one or several deployment models of the ArcGIS platform to enable web GIS to support their different lines of business.





## What Is Portal for ArcGIS?

Portal for ArcGIS is a mapcentric content management system that an organization can host within its own infrastructure. Portal can be deployed on Windows or Linux operating systems and installed on an organization's physical machines or in the cloud. It is software that enables an organization to deploy the portal concept of the web GIS pattern. An organization that installs Portal for ArcGIS would typically already be using ArcGIS for Server as part of its GIS operations and is responsible for the setup, configuration, and management of the portal.

## Why Choose Portal for ArcGIS

There are several reasons why an organization chooses to implement Portal for ArcGIS instead of using ArcGIS Online for its web GIS portal. An organization may have sensitive data that cannot be uploaded and stored in the cloud. Perhaps the organization has unique security constraints and IT policies that can only be addressed by running the ArcGIS platform within the organization's IT infrastructure. There may be requirements to honor strict servicelevel agreements that cannot be currently met with ArcGIS Online. The organization may work in an isolated/disconnected network environment that does not have Internet access. While Portal for ArcGIS offers many capabilities available in ArcGIS Online, some functionality may not yet be available because its development and release schedule follows that of ArcGIS Online.

of GIS content and promotes collaboration between staff within an organization. As a content management system, Portal for ArcGIS can register and store many common types of GIS content associated with ArcGIS such as web services, web applications, map documents, layer files, layer packages, geoprocessing packages, and shapefiles. It also supports many standard file formats such as comma-separated values (CSV); Adobe PDF; and Microsoft Word, Excel, or PowerPoint files.

When a web service, web application, or data file is registered or created in Portal for ArcGIS, it becomes a Portal item. An item defines a unique searchable element in the portal that has descriptive information associated with it and must be tagged with keyword(s). Depending on the type of GIS content added, in some instances, the GIS resource is simply being referenced and not physically moved into Portal. For example, items could be referenced to an online resource such as a web service or web application, or they can contain actual data such as a tile package or PDF document. Portal for ArcGIS can aggregate all of an organization's GIS assets and related data files into a central location. It is a content management system for GIS resources that is easily searchable and accessible through the user-friendly Portal website.

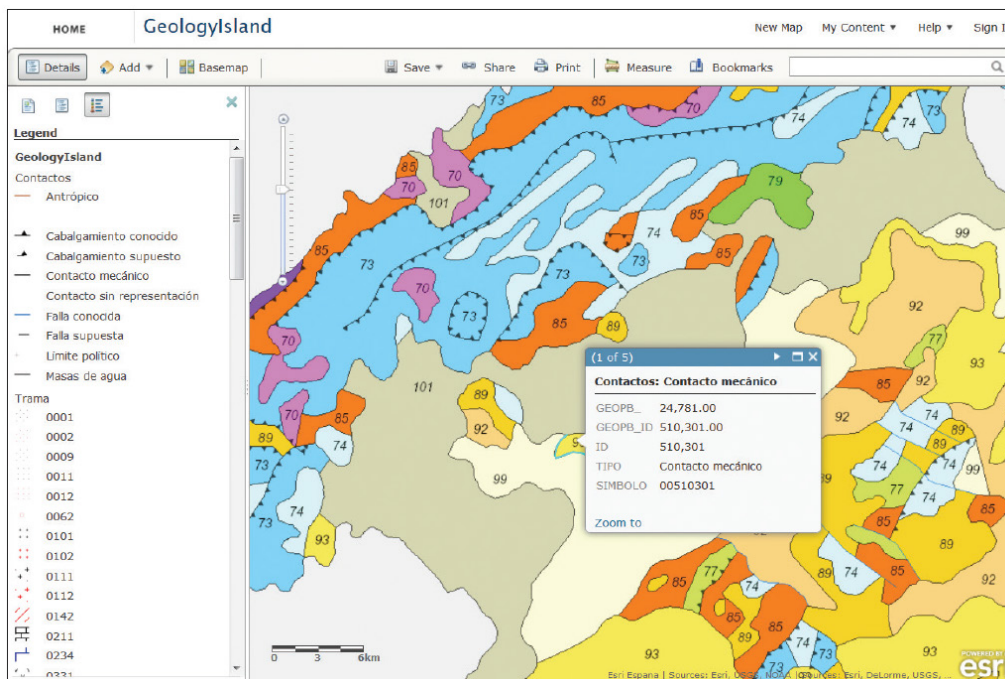
Items in Portal for ArcGIS can be organized into Groups.

Conceptually, a Group is like a folder containing a collection of items. A Group can also be empty and have no items (e.g., when a group is first created). Groups can categorize items for organizational purposes and be leveraged to control access to items. When an item is first created, it is private by default.

Only the item owner can see and access it. The item owner determines

if the item will be shared with a specific group or groups, with the organization, or with everyone (i.e., publicly accessible).

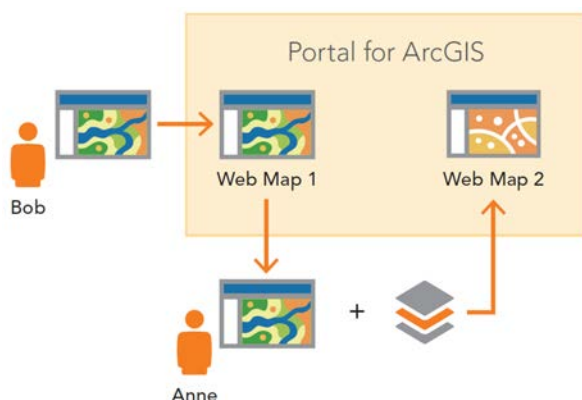
For example, item A is a registered web service, and item B is a PDF document that has been uploaded into Portal. Item A has been shared with the organization, but item B is only shared with the Survey group. Only members who belong to the Survey group are able to see and access item B, but all Portal members are able to see and access item A.



## Key Features

A common misperception is that Portal for ArcGIS simply provides a website for displaying GIS content that facilitates the search and discovery of spatial assets. It is much more than a website. While the website is the primary interface for Portal, it is actually a mapcentric content management system that provides a framework for the management

Groups can be used to promote sharing and collaboration for specific items among certain staff in the organization and can be created for different departments, teams, business units, projects, organizational themes, or used to replicate the internal structure of the organization.



## Portal for ArcGIS Map Viewer

A key aspect of the Portal for ArcGIS website is the map viewer. It provides an interactive means to perform mapping and visualization of GIS data. A user first selects a basemap, then searches for GIS content (typically web services) and adds them as operational layers (i.e., business information) onto the basemap. Optionally, the display properties of the operational layers can be configured such as setting transparency and symbology and activating and customizing pop-ups and attribute tables. Users can also add and display their own data, such as CSV, TXT, and shapefiles, on the map. The map viewer offers a simple and user-friendly mapping experience that makes it easy to find, assemble, and create map information products. It empowers those without GIS expertise to leverage GIS technology with their organization's GIS assets in a very accessible manner that extends GIS technology to a broader user base.

## Web Maps

After creating a map in the map viewer, a Portal member can save it as a web map. A web map is a container that stores map definition (e.g., layers, visibility, and extent) and behaviors (e.g., pop-up windows). The web map concept is an important part of the web GIS pattern and the ArcGIS platform. A web map is one of the mechanisms that promotes and facilitates sharing and collaboration in Portal for ArcGIS.

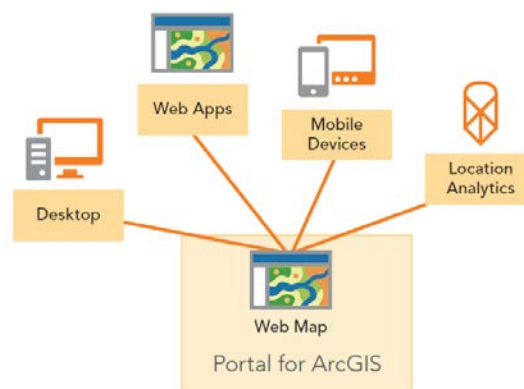
For example, a member named Bob creates a new web map in the map viewer, saves it, and shares it, making it available to other Portal members. Anne, a coworker, can open Bob's web map in the map viewer and use it as a starting point for her own mapping visualization. She may add or modify the map contents, save it as a new web map, and share it with other members. Anne leverages Bob's work, and they have both extended the organization's GIS content by contributing back their data and analysis.

This workflow can continue and allow many Portal members to interact with and leverage the web maps stored in Portal. In effect, this is collaboration of spatial content based on maps. It is recommended that groups be used to help organize, filter, and govern the overall collection of web maps and other GIS content within Portal for ArcGIS. Portal members can also make web maps available to people outside Portal for ArcGIS by sharing with everyone and embedding web maps in HTML pages or directly sharing URL links to web maps with others.

Web maps work with all ArcGIS platform client applications: ArcGIS for Desktop, the ArcGIS web mapping APIs and viewers (JavaScript, Flex, and Silverlight), the ArcGIS mobile apps and APIs (iOS, Android, and Windows Phone), ArcGIS Runtime SDKs, and Esri Location Analytics products (e.g., Esri Maps for Office, Esri Maps for SharePoint, and Esri Maps for IBM Cognos). Web maps with custom map definitions and behaviors will all be honored in the ArcGIS platform client applications. The web map is an interactive display of geographic information that can be used to tell stories and answer questions across multiple platforms and devices and within many enterprise business systems. This further extends the reach of GIS assets within an organization.

## Application Templates

Portal for ArcGIS members can also build web applications for their web maps using the application templates included with Portal. With these templates, members can create and deploy new web mapping applications for a web map without any programming. Once a web map is saved



and shared, a Portal member can select an application template, and the map's data content populates the template to create a new web application.

The web application can be hosted within Portal for ArcGIS, or its code can be downloaded onto a local machine and then hosted on an organization's web server. Portal for ArcGIS includes many different application templates, and some can be further configured and customized. Each template is designed for a specific use case such as telling a story or answering questions.

## Hosted Services

Portal for ArcGIS members can also add their own data to Portal to create a hosted web service. Two types of hosted web services are available: tiled map services and feature services. Tiled map services are typically used for static data. Feature services are typically used for dynamic data. A Portal member can add data to Portal to create a hosted web service under the My Contents section of the Portal website. ArcGIS for Desktop and Esri Maps for Office users can also connect to Portal for ArcGIS and publish GIS content to Portal as a hosted web service.

## ArcGIS Online Content

Portal for ArcGIS also provides access to all nine basemaps available from ArcGIS Online: Imagery, Imagery with Labels, Streets, Topographic, Terrain with Labels, Light Gray Canvas, National Geographic, Oceans, and OpenStreetMap. Optionally, premium content from ArcGIS Online can also be used with Portal.

## Architecture

Portal for ArcGIS, an optional extension included with the ArcGIS for Server Advanced edition (Workgroup and Enterprise levels), is a different and separate installation from ArcGIS for Server. It requires installation of the ArcGIS Web Adaptor, which is included with ArcGIS for Server. The Web Adaptor integrates Portal with an organization's web server architecture, enabling Portal to use an organization's identity store and security policies at the web-tier level. Portal for ArcGIS includes its own identity store but also supports both Integrated Windows Authentication (IWA) and Public Key Infrastructure (PKI) authentication for logging into the Portal website and accessing its content. Portal for ArcGIS and ArcGIS for Server can be installed on the same machine or on separate machines. Optionally, they can share the same Web Adaptor. A Portal for ArcGIS instance includes:

- The Portal website with map viewer
- A repository that contains the Portal content and index files
- Application templates that can be used to deploy web applications for web maps
- The Portal Sharing API, which exposes Portal for ArcGIS functionality as a REST endpoint and enables access to the ArcGIS Portal Directory

When installing and setting up Portal for ArcGIS, the first time you attempt to access the Portal website, you will need to specify an initial administrator account. You create this account when you initially log into and configure Portal for ArcGIS. This is not an operating system account. It only exists in the Portal for ArcGIS instance. After the initial configuration of your Portal instance, you can specify other accounts as administrators, demote the initial administrator account to a different role, or delete it.

Portal for ArcGIS can be accessed with or without an ArcGIS organizational account. When you access Portal with an ArcGIS organizational account, you become a Portal member and can be assigned into one of three role types: Administrator, Publisher, or User. Portal for ArcGIS administrators control which role is assigned to a Portal member.

Portal for ArcGIS administrators can customize and configure many different properties of the Portal website and determine the functionality available. They can change the look and feel of the website home page, change gallery page settings, set featured groups, define the basemaps available in the map viewer, choose application templates, and set utility services. Utility services are the web services that power specific functionality in Portal such as printing maps, locating addresses, calculating area, and routing. Portal for ArcGIS includes some default web services from ArcGIS Online for utility services, but you can optionally use your organization's web services to enable the utility services.

## Integration with ArcGIS for Server

Portal for ArcGIS complements ArcGIS for Server because it provides an attractive front-end user experience for web services from an ArcGIS Server site. In addition, you can use ArcGIS Server web services to power Portal's utility services such as geocoding, high-quality printing, and routing. Portal for ArcGIS can be integrated with ArcGIS for Server in three ways.

## Portal for ArcGIS with Registered Web Services

You can register web services from an ArcGIS Server site with Portal by simply adding the web services as Portal items. The items reference the URL addresses of the web services. You can register both public and secured web services with Portal. For secured web services, you can optionally save the authentication credentials with the item or have users submit authentication credentials when they access it. Portal for ArcGIS and ArcGIS for Server are two separate entities, each with its own identity stores. Conceptually with this integration, Portal for ArcGIS and ArcGIS for Server are loosely coupled. Portal can have many registered web services from many different ArcGIS Server sites.

## Portal for ArcGIS with a Federated Server

In this configuration, Portal for ArcGIS and ArcGIS for Server are more closely integrated. When you federate an ArcGIS Server site with Portal, it uses Portal's identity store. This means that all Portal for ArcGIS members are now the only valid logins to the ArcGIS Server site. The ArcGIS Server site's identity store is no longer used.



Any web services that are published to the ArcGIS Server site will automatically be available as an item in Portal, and when users try to access the item, they will have a single sign-on user experience. Portal can be federated with multiple ArcGIS Server sites.

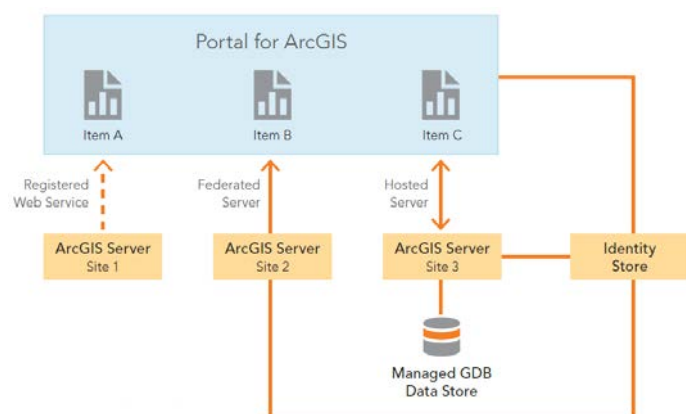
## Portal for ArcGIS with a Hosted Server

In this option, you can configure a federated ArcGIS Server site to be a hosting server for Portal. This enables Portal members who are publishers to publish tiled map services and feature services to Portal. They can publish hosted web services directly in Portal, ArcGIS for Desktop, and Esri Maps for Office. The web services are hosted by ArcGIS Server on the back end. This option requires a multiuser geodatabase that is registered as a managed geodatabase data store for the federated ArcGIS Server site. Portal can only have one ArcGIS Server site as a hosted server. A Portal for ArcGIS instance can use one or all of these integration options with ArcGIS for Server and with multiple ArcGIS Server sites. Selecting which integration option(s) to use will depend on your organization's business workflows.

## Clients to Portal for ArcGIS

All ArcGIS platform client applications work with web maps from Portal for ArcGIS. ArcGIS for Desktop and both the ArcGIS viewer applications (Flex and Silverlight) are good examples of clients that fully support web maps. Portal for ArcGIS leverages your existing GIS investments because you can register all your existing GIS web applications as Portal items. Several ArcGIS client applications have been designed specifically to work with Portal for ArcGIS (and ArcGIS Online).

- Esri Maps for Office provides mapping capabilities in Microsoft Office through an add-in. You can use this add-in with Microsoft Excel to create web maps in Portal that show data from Excel spreadsheets.

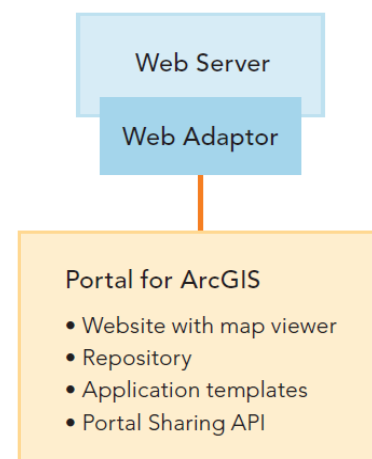


Additionally, an add-in for Microsoft PowerPoint lets you embed these web maps into your presentations.

- Esri Maps for SharePoint provides mapping capabilities in Microsoft SharePoint through a map Web Part for SharePoint pages. You can use this to display content from Portal for ArcGIS in your SharePoint pages. It

also includes a locate workflow that spatially enables SharePoint lists containing address data.

- Collector for ArcGIS is a field data collection and editing app for smartphones and tablets designed to help field staff rapidly collect and update data in the field using web maps from Portal for ArcGIS.
- Operations Dashboard for ArcGIS allows decision makers, operations managers, and section leaders to monitor activities and events; track their field work force; and assess the status of daily operations. The Operations Dashboard app creates and manages operation views within Portal. When members open an operation view in Portal, it downloads and installs the app on their computer. These ArcGIS client applications extend the reach of your organization's GIS assets in Portal for ArcGIS to a broader user base.



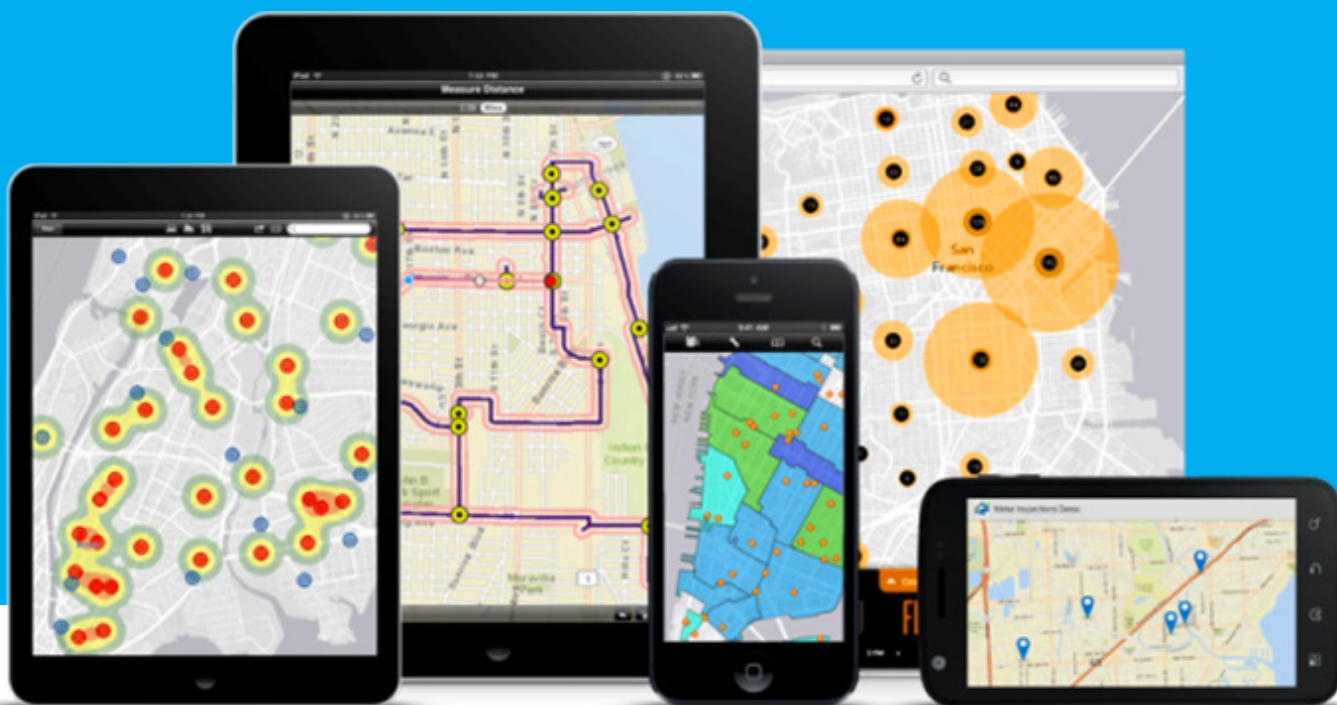
## Portal for ArcGIS with a Hosted Server

Web GIS is a pattern for delivering GIS capabilities and a key concept of implementing GIS as a platform. Portal for ArcGIS is a mapcentric content management system that enables an organization to deploy the portal concept of the web GIS pattern in its own infrastructure. Portal for ArcGIS is more than a website. It is a framework for the management of GIS content and promotes collaboration between users within an organization. Portal leverages existing GIS investments by making them discoverable and more accessible. By empowering people to use and create maps accessed from many client apps and platforms, it extends the reach of GIS to everyone in the organization, enabling better decision making.

## About the Author

Derek Law works on the ArcGIS for Server product management team. He is involved with requirements gathering, software development, and product evangelism. His technical expertise is focused on ArcGIS for Server, Portal for ArcGIS, and web mapping technologies. He has an MSc in remote sensing from the University of Victoria, British Columbia, Canada. ◆

# ArcGIS and Developers



ArcGIS is the platform for developers who want to build location-based apps that support the specific needs of their users. With ArcGIS, you can develop apps using the APIs or SDKs of your choice and deploy them on any platform or device. Apps you create using ArcGIS developer tools can also connect to Esri's cloud services, letting you access a wide range of ready-to-use content and location services. Anyone with an ArcGIS Online account or enterprise login can access ArcGIS APIs and SDKs. Esri also offers a free development and testing account to help developers get started. More information about how to sign up for an introductory developer account is available at [developers.arcgis.com/sign-up](http://developers.arcgis.com/sign-up).

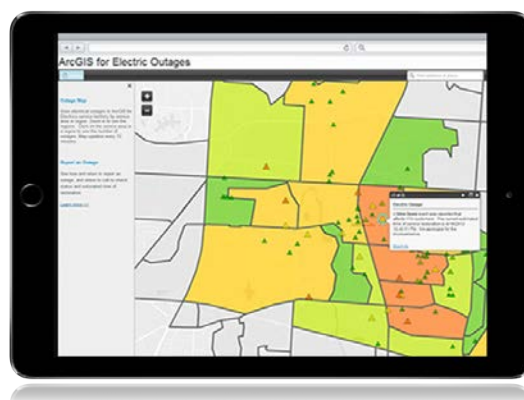
## Build Apps for Any Audience

ArcGIS lets you build apps for anyone who needs them. You can create apps as an internal developer in an ArcGIS organization, build apps for other ArcGIS users, or share your apps with the community at large. Regardless of your audience, ArcGIS apps help you deliver key insights to end users so they can make better, more informed decisions.

When you develop apps for users in your organization, you can deliver tailored functionality that suits their specific workflows. For example, you can build a network monitoring app (like the one shown to the right) that lets utility managers quickly examine areas affected by an outage, isolate the cause, and dispatch personnel to the site of the problem. Your internal-facing apps can integrate with your organization's user logins, security permissions, and enterprise systems. They can also securely access any

ArcGIS content and services you host behind your firewall.

ArcGIS also lets you create public-facing apps that deliver information and tools to a wide audience. ArcGIS helps you streamline your apps so users can quickly and easily find the information they need. For example, a city can deploy a web app that lets residents select their neighborhood to see the real-time locations of tree trimmers, snowplows, or sanitation trucks.



You can also build apps for the ArcGIS user community and provide them as an authorized developer. With ArcGIS, you maintain full ownership over the data you use in your apps and the revenue they earn. When you publish your apps to the ArcGIS Marketplace, you can take advantage of tools to generate leads and manage subscriptions, offer free trials, and promote your apps directly to ArcGIS users.

## Develop on Any Platform - ArcGIS APIs & SDKs

ArcGIS includes a variety of developer APIs and SDKs so you can build custom apps for any platform or device—including smartphones, tablets, desktops, and web browsers. These development options give you the flexibility you need to deliver focused capabilities to the client platforms that make sense for your users.

### Mobile SDKs

You can use ArcGIS developer tools to build native apps for mobile devices like smartphones and tablets that let you access ArcGIS content and capabilities in the field. These apps can take advantage of the unique technology available on these devices, including onboard GPS software, built-in cameras, messaging services, and more. Your apps can also access and edit your maps and data while offline, then sync the changes later.



ArcGIS offers runtime SDKs for common mobile platforms including:

- **Android** — The ArcGIS Runtime SDK for Android lets you build Android apps that incorporate the powerful mapping, geocoding, geoprocessing, and other spatial analysis capabilities provided by ArcGIS. The SDK includes a plug-in to the Eclipse integrated development environment (IDE) that provides a rich set of tools, documentation, and samples to help developers create applications using the SDK.
- **iOS** — With the ArcGIS Runtime SDK for iOS, you can develop focused applications for iOS devices like iPad and iPhone that incorporate the powerful mapping, geocoding, geoprocessing, and other spatial analysis capabilities provided by ArcGIS. You can develop your iOS apps in whatever programming language you prefer—Swift or Objective-C.
- **Windows Phone** — The ArcGIS Runtime SDK for .NET lets you create native Windows applications that you can deploy on Windows Phone devices in the field. You can reuse code from applications that you develop

for Windows Desktop and Windows Store, allowing you to create apps that run on all Windows devices, regardless of form factor.

### Desktop SDKs

ArcGIS developers can also build native apps for desktop platforms that integrate a wide range of ArcGIS mapping and analysis capabilities. For example, your apps can display and edit maps while offline, access data in the cloud, run geoprocessing tools, perform geocoding and place search, and generate optimized routes.



ArcGIS offers runtime SDKs for major desktop platforms including:

- **OS X** — With the ArcGIS Runtime SDK for OS X, you can develop Cocoa applications for Macs that incorporate a wide range of mapping and spatial analysis tasks including data visualization, editing, geocoding, routing, and more. Application logic you write for OS X can be reused in iOS and vice versa by simply changing the UI to target the appropriate device.
- **Windows Desktop** — The ArcGIS Runtime SDK for .NET lets you build ArcGIS applications that run on the Windows Desktop platform. You can reuse code from applications that you develop for Windows Phone and Windows Store, allowing you to create apps that run on all Windows devices, regardless of form factor.
- **Windows Store** — With the ArcGIS Runtime SDK for .NET, you can create Windows Store apps that take advantage of the powerful mapping and analysis capabilities of ArcGIS. You can reuse code from applications that you develop for Windows Desktop and Windows Phone so your apps can run on all Windows devices.

### Web APIs

You can also develop web applications that are accessible anywhere, in any web browser, and on any device. These apps can deliver content and services provided by ArcGIS to anyone who needs them, whether they're hosted on premises, in the cloud, or both.



For example, you can create a public awareness app that shows residents what critical services are available to the local community and where to access them.



ArcGIS offers web APIs for common web development platforms including:

- **Flex** — The ArcGIS API for Flex lets you develop dynamic rich Internet applications that incorporate the mapping and spatial analysis capabilities of ArcGIS. Apps you create with the ArcGIS API for Flex are built on the Apache Flex framework, which lets you develop using Flex components like grids, trees, and charts.
- **JavaScript** — With the ArcGIS API for JavaScript, you can build and deploy web applications that use content and services from ArcGIS. The API is built on JavaScript frameworks like Dojo, jQuery, or ExtJS, so you can develop using HTML5 and CSS3 components. Your JavaScript applications also support popular web browsers like Chrome, Firefox, Internet Explorer, Safari, and mobile browsers, so they can work anywhere.
- **Silverlight** — The ArcGIS API for Silverlight lets you create web applications that use the powerful mapping and analysis capabilities of ArcGIS. Apps you create with the API are built on the Microsoft Silverlight framework, which lets you develop using Silverlight components such as data grids, trees, charts, and panels.

## Cross-Platform SDKs

ArcGIS also offers runtime SDKs for application frameworks that support cross-platform development. These development options make it easy to develop your app once, then deploy it on multiple platforms.



Cross-platform development options for ArcGIS include:

- **Java** — With the ArcGIS Runtime SDK for Java, you can develop focused mapping and analysis applications for Windows and Linux platforms. The SDK includes code samples and project templates that demonstrate how to implement the API as well as best coding practices to help you get started. You can also develop your applications with a series of included SDK jars and an Eclipse plug-in.
- **Qt** — The ArcGIS Runtime SDK for Qt lets you build native, cross-platform mapping and analysis applications for Android, iOS, OS X, Windows, and Linux. These apps support modular deployment, so you only need to maintain the parts of the library that your apps depend on.

## Access Ready-to-Use Content

ArcGIS includes a living atlas of ready-to-use content that you can use in your apps, such as basemaps, imagery, and thematic maps covering hundreds of topics. You can combine this content with your own data to create new maps and apps designed specifically for your users. With ArcGIS, your apps can access imagery for the entire world, as shown to the right. This imagery is built from the best available data provided by both commercial and community sources. ArcGIS also offers near real-time imagery for parts of the world affected by major events. In addition, you can use ArcGIS to compare current and historical imagery to survey changes over time, such as conditions before and after a disaster.



Your apps can also incorporate ready-to-use basemaps including administrative maps, street maps, imagery, topographic maps, historical maps, and more. These maps use authoritative data from commercial and community data providers. For example, you can use the OpenStreetMap basemap to provide an underlying street map for your data.

ArcGIS includes a rich set of topical maps that you can implement as part of your apps. You can choose from hundreds of maps that explore human populations and activities, visualizing data related to demographics, lifestyles, consumer spending, businesses, public health, traffic patterns, urban infrastructure, and more. Your apps can also access maps for biological systems such as ecoregions, plant and animal ranges, and wetlands, as well as physical systems such as oceans, climates, and natural hazards.

## Use Cloud Services

Apps you develop using any of the ArcGIS APIs can access and use cloud services provided by Esri. These cloud services let you integrate useful content and capabilities in your apps including demographic data, geocoding and routing tools, and more. Many of these services can also be accessed locally while offline so you can use them anywhere, regardless of connectivity.



ArcGIS provides web services APIs that let you incorporate these services in your apps. For example, ArcGIS includes APIs for:

- **Mapping and Visualization** — ArcGIS lets you mash up maps from different web services for use in your apps, including maps you host on premises, preconfigured web maps provided by Esri, maps from authoritative providers, and content from third-party sources. This lets you include any content that might be useful to your users in your map-based applications.
- **Directions and Routing** — Your apps can access ArcGIS routing services to generate routes, define drive-time areas, and produce turn-by-turn driving directions. You can calculate optimized routes to multiple locations so you can produce more efficient schedules for delivery or maintenance crews. Route analysis tools can also help you find the nearest location in a category, like the closest gas station, hospital, or grocery store.
- **Geocoding** — ArcGIS provides a geocoding service that helps your apps pinpoint the locations of addresses and named places all over the world. For example, if you know the address of a business and want to put it on a map, you can use the geocoding service to find the coordinates. You can also perform reverse geocoding to find the address for a particular location, or plot multiple addresses at once using batch geocoding. Your apps can store geocode results in your database or in the cloud for analysis and use.
- **GeoEnrichment** — Your apps can use ArcGIS GeoEnrichment services to retrieve demographic and contextual data about the area you want to examine. For example, you can use Esri's market data to analyze areas frequently visited by your users, find other areas with similar characteristics, and share shopping and dining recommendations with users when they plan trips to those areas.
- **Geotriggers** — You can use the Geotrigger Service to add location awareness to your apps. The Geotrigger Service lets you create geofences that flag certain regions on a map. When a user's device enters or leaves a geofenced area, a specific action is triggered. For example, your app can deliver personalized offers to customers as they pass by your store, notify citizens of road closures and detours before they arrive, or automate home and office functions based on the location of the user.
- **Feature Services** — Your apps can query and edit stored geographic datasets and associated metadata by consuming feature services. As you pan and zoom the map view, relevant features in the map extent are returned and added to the map. This allows your users to easily find the content they need. For example, your app can help users search for a particular type of store or restaurant.
- **Spatial Analysis** — Your apps can incorporate spatial analysis services that let you perform common spatial analyses on your content. This allows your users to find places within a certain distance, see the prevalence of certain characteristics within an area, detect hot spots, and more.
- **Elevation Analysis** — Your apps can include elevation analysis tools that let you analyze the characteristics of surfaces. For example, your apps can estimate how road grade for a route will impact fuel and energy consumption. You can also analyze visibility for areas you are interested in, like parks and campgrounds.
- **Geometry Operations** — With ArcGIS, your apps can perform complex geometric analysis tasks. For example, you can calculate areas and lengths for a polygon feature, determine distances between geometries, combine and intersect areas, generate buffers, and more.

The apps you create with ArcGIS can also access spatial analysis tools that you publish as services within your own infrastructure. This lets you deliver focused apps that help users across the organization make more informed decisions and achieve the best possible outcomes. For example, you can build a public safety planning app (like the one shown to the right) that detects crime hot spots, overlays service areas for emergency response units, and identifies underserved areas that require additional resources.

You can integrate ArcGIS with other software products that you deploy across your organization such as BI, CRM, and ERP systems. This lets you access your maps and analysis tools directly inside the systems you already use. ArcGIS includes out-of-the-box integrations for common business platforms such as Microsoft Office, IBM Cognos, and Dynamics CRM. You can also add mapping and analysis capabilities to your other applications and enterprise systems using the ArcGIS APIs and SDKs.

## Take Maps and Data Offline

With ArcGIS apps, the basemaps and operational data you deliver as services can be downloaded to the device so multiple users can make edits to the same data while disconnected. When users check back in to the network, they can sync with the database to apply edits back to the service or update the application with changes made by other users. If more than one user edits the same feature and the edits conflict, the most recent edit overrides the others. This setup is ideal for supporting large numbers of offline users who need to work with the same data.



For example, you can provision features, tabular data, tile caches, locators, and network datasets for use with your apps.



## Work with Open Source


ArcGIS lets you work with open-source code samples, templates, and solutions and use them in your apps. Esri currently supports more than 200 projects on GitHub including web frameworks, editors, client libraries, web and mobile apps, spatial analysis dashboards, storytelling templates, local government tools, and industry solution templates. You can collaborate with us on these projects by submitting edits and contributions, or use the existing code to support your unique applications.

More information about Esri's open-source projects is available at our GitHub community at [esri.github.io](https://esri.github.io).

## Join the Developer Community

Esri supports the ArcGIS development community with developer-focused events, online help documentation, training, and more. These resources help developers use our platform to deliver valuable geospatial solutions that meet the needs of their users.

Each year, Esri hosts a number of events for developers including conferences, meet-ups, hackathons, and more. These events provide opportunities for the development community to meet one another, learn about ArcGIS apps and developer tools, share information and ideas, and shape the future direction of Esri technology.

Esri also provides online resources including developer websites, help documentation, code samples, user forums, community support pages, training, videos, and more. These online resources are available at [developers.arcgis.com](https://developers.arcgis.com). 

# ArcGIS and Open

Esri has built ArcGIS to take advantage of open standards, open formats, and open-source technology, so your data and systems are interoperable with a wide range of technologies and IT infrastructures. We have also developed hundreds of open-source projects that are available for developers to modify, use, and contribute to through GitHub. In addition, we provide open APIs for our platform that let you deploy and use GIS applications that fit your needs. Together, our open initiatives have allowed us to build a complete, open, and interoperable GIS platform that can be incorporated into virtually any enterprise environment.

## Open Standards

ArcGIS conforms to open standards and enterprise IT frameworks that allow users to incorporate GIS into any application in a variety of web, mobile, and computing scenarios. We also participate in the development of GIS standards through organizations like the Open Geospatial Consortium, Inc. (OGC) and the International Organization for Standardization (ISO) technical committee 211 (TC 211).

Some of the standards and technologies ArcGIS supports include:

- Web service standards such as XML, SOAP, REST, and WSDL.
- OGC specifications such as WCS, WFS, WMS, KML, and GML.
- Metadata standards such as profiles from FGDC, ISO, INSPIRE, and Dublin Core.
- Network protocols such as TCP/IP, SSL, SAML 2.0, HTTP, and HTTPS.
- Security and privacy standards such as ISO 27001, FedRAMP, and SSAE 16 SOC1 Type2. In addition, ArcGIS Online has received FISMA Low Authority to Operate (ATO) and is certified compliant with TRUSTe Certified Privacy Seal.

More information about our support for IT and GIS standards is available at [esri.com/software/open/standards](https://esri.com/software/open/standards).

## Open Data Formats

ArcGIS supports data from a wide range of sources and formats. For example, ArcGIS supports common data formats like shapefiles, CAD and raster data,

geospatial files from third-party developers, spatial types from relational databases, and standards-based web services. This allows our users to incorporate any data that might be useful in their maps and analysis.

In addition to our broad out-of-the-box data support, we offer an optional extension that makes it easier to define new custom data sources and convert data between GIS and tabular data formats. With this extension, you can read, transform, and write data in hundreds of formats, with no custom coding required.

ArcGIS also makes it easy to discover and share open data from thousands of organizations around the world. You can browse public-facing open data websites to search for and download the data you need in a variety of common, easily reusable formats.

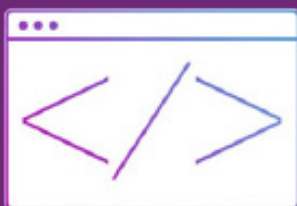
More information about our broad support for open data formats is available at [esri.com/software/open/dataformats](https://esri.com/software/open/dataformats).

## Open-Source Technology

The ArcGIS platform is designed to work out of the box with a wide variety of open-source software solutions. Esri also supports developers and users who explore open-source solutions to complement and customize our products. By letting you deploy solutions that use open-source technology, ArcGIS gives you more options for implementing industry-leading GIS software within your existing IT infrastructure.

Some of the open-source technologies that ArcGIS supports include:

- **Apache Tomcat and Apache HTTP Server** — ArcGIS Runtime SDK for Java supports the Apache Tomcat servlet engine and Apache HTTP Server.
- **GDAL** — ArcGIS for Server includes the GDAL translator library for raster data formats, released under an X/MIT style license by the Open Source Geospatial Foundation.
- **Linux** — ArcGIS for Server supports the Red Hat Enterprise Linux Server and SUSE Linux Enterprise Server operating systems.
- **PostgreSQL** — ArcGIS for Desktop and ArcGIS for Server support PostgreSQL open-source databases and the PostGIS spatial type.
- **Python** — ArcGIS developers can use the Python open-source scripting language to build geoprocessing



scripts, custom tools, automated batch processes, or even complete applications.

In addition, Esri regularly contributes open-source projects that allow you to build on existing source code. We currently support more than 300 projects on GitHub including applications, tools, examples, and resources that let you simplify, customize, and enhance your GIS experience. You can collaborate with us on these projects by submitting edits and contributions, or you can use the existing code to support your own solutions.

More information about our open-source projects is available at our GitHub community at [esri.github.io](https://esri.github.io).

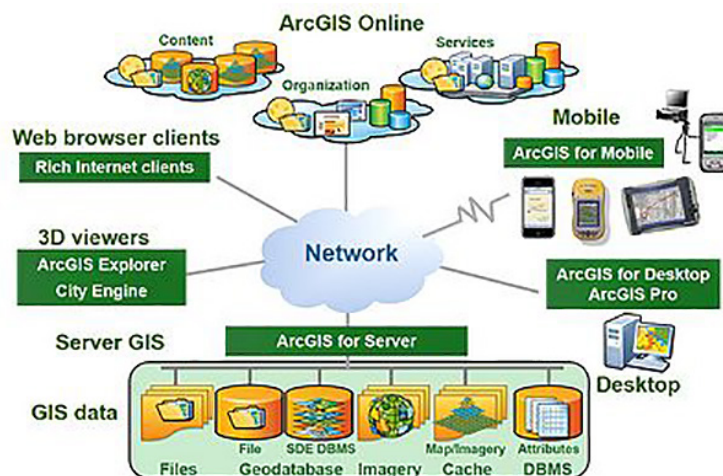
## Open APIs

Esri provides open APIs that expose mapping and analysis services provided by the ArcGIS platform. These APIs allow a wide range of applications and systems to access and communicate with ArcGIS. Our open APIs include:

- **ArcGIS REST API** — ArcGIS REST API provides a simple, open web interface to ArcGIS. The API allows you to create and use geospatial services, access ready-to-use services hosted by Esri, and manage the way ArcGIS is used in your organization. This open design framework lets developers combine ArcGIS services with other information from many different sources. It also gives users access to a tremendous wealth of geographic knowledge created in ArcGIS environments.
- **ArcGIS API for JavaScript** — The ArcGIS API for JavaScript helps you build and deploy lightweight web and mobile applications that use content and services from ArcGIS. These apps support popular web browsers like Chrome, Firefox, Internet Explorer, Safari, and mobile browsers, so they can work anywhere and on any device.
- **Esri Leaflet** — Esri Leaflet is a lightweight set of tools for working with ArcGIS services using Leaflet. These tools let you easily incorporate Esri basemaps, feature services, tiled map services, and dynamic map and image services in HTML mapping applications.

More information about our APIs is available at [developers.arcgis.com](https://developers.arcgis.com). 📌

# The ArcGIS Platform: An Architecture Overview



**Enterprise implementations typically include a mix of software technology and data sources carefully selected to satisfy specific operational business needs.**

The ArcGIS platform includes an integrated mix of software developed to satisfy a full range of GIS user requirements. All of these components are designed as a system to work together within an integrated enterprise GIS environment. This is the big picture of what ArcGIS has to offer in building an enterprise GIS. ArcGIS is the overall platform, and the components of this platform work together to satisfy a variety of specific business needs.

**Desktop GIS:** The ArcGIS for Desktop family is developed from a common set of ArcGIS object relational executables, delivering a fully integrated set of scalable desktop product offerings. Lighter desktop applications include ArcReader, ArcGIS Engine, and ArcGIS Runtime focused applications. ArcGIS Pro makes the GIS functionality you most often use easy to access so you can get your work done faster without a big learning curve.

**Server GIS:** ArcGIS for Server provides technology for publishing GIS services that can be consumed by ArcGIS for Desktop, mobile GIS, and standard web browsers. ArcGIS for Server has grown over the last few releases to include imagery, SDE geodatabase access, and distributed geodatabase management within a common set of ArcGIS executables.

**GIS Data:** Data management solutions are provided for file data sources, geodatabase, imagery, and pre-processed map cache. Files include GIS shapefile and file geodatabase formats. SDE geodatabase is used for multi-user GIS data maintenance operations. Imagery is fully integrated with ArcGIS since the ArcGIS 10 release. A map cache is a file share that delivers preprocessed map tiles as high-performance basemaps for map display.

**Web Browser Clients:** A variety of web applications and

browser clients extend ArcGIS access throughout the web community. ArcGIS offers APIs for web application development on JavaScript, Adobe Flex, Microsoft Silverlight, and WPF platforms. ArcGIS for Server delivers mapping services with additional capabilities for web applications using SOAP and Open Geospatial Consortium (OGC) web service APIs.

**3D Viewers:** ArcGIS for Desktop extensions include 3D Analyst and CityEngine for 3D modeling and data management. A free ArcGIS Explorer download can be used as a light desktop 3D viewer. 3D ArcScene data packages shared from CityEngine can be viewed with the free CityEngine Web viewer. ArcGIS for Server also delivers KML services for 3D overlay with Google Earth and Microsoft Virtual Earth web clients.

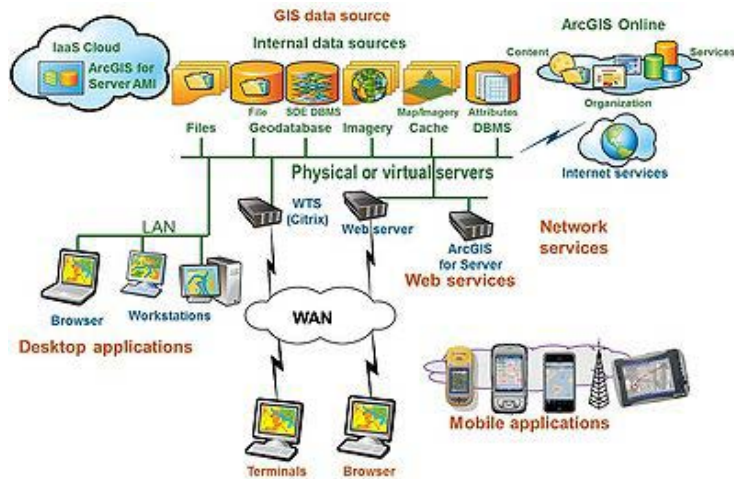
**Mobile GIS:** Mobile devices extend GIS to include mobile operations and use by the general public. ArcPad is an optimum application used by several Esri vendors for data-collection workflows. ArcGIS for Windows Mobile connects mobile operations into enterprise GIS workflows. ArcGIS on smartphone devices (iOS, Android, and Windows Phone platforms) delivers GIS for the general public.

**GIS Web Services:** GIS web services support a variety of managed, hosted, and shared GIS online services. Portal for ArcGIS is a fundamental part of the ArcGIS platform, delivering a self-service content management and information sharing framework for empowering enterprise operations throughout the organization. A variety of software as a service (SaaS) mapping solutions are provided, including subscription services for publishing named user map services in the cloud.



# GIS Software Selection

Selecting the right software and the most effective deployment architecture is very important. ArcGIS technology provides many alternative architecture solutions and a wide variety of software, all designed to support specific user workflow needs as shown in the figure below.



GIS software technology alternatives:

- What are the best data sources?
- What user workflows should be supported by GIS desktop applications?
- What can be supported by cost-effective web services?
- What business functions should be supported by network services?
- Where will mobile applications improve business operations?

Reviewing the available technology alternatives and how each performs and scales within your user environment can provide critical information needed to make the right technology decisions.

## GIS Data Sources

Operations can be supported on local disk or CD-ROM, DVD-ROM, shared file servers, geodatabase servers, imagery, preprocessed map cache, or web data sources.

- Cached map services provide the highest performance and scalability.
- Local data sources support high-performance productivity requirements with minimum network latency.
- Remote web services allow connection to a variety of published data sources, with the drawback of potential bandwidth congestion and slower performance.

## Desktop Applications

The highest level of functionality and productivity is provided by local ArcGIS for Desktop applications.

- Professional GIS users will be more productive with the ArcGIS for Desktop software.
- Desktop applications are supported on user workstations or hosted on central Windows Terminal Server farms.

## Web and Network Services

ArcGIS for Server technologies provide efficient support

for a wide variety of more focused GIS user workflows.

- Provide an efficient way to share data to support remote client workflows.
- Provide the most efficient way to publish standard map information products.
- A cost-effective way to leverage GIS resources to support users throughout the organization and associated user communities.

## Mobile Applications

A growing number of GIS operations are supported by more loosely connected mobile GIS solutions.

- ArcGIS technology supports workflow operations that include disconnected editing and remote wireless operations.



- Disconnected architecture solutions can significantly reduce infrastructure costs and improve user productivity for many field operations.

Most enterprise GIS solutions include a mix of ArcGIS technology tailored to meet specific business needs. ArcGIS technology works together as an integrated system environment, with each component optimized for optimum user productivity.

## Software Technology Cycle

Software and hardware product life cycles are getting shorter as technology improves more rapidly each year. ♦



# Bringing the R and ArcGIS Communities Together

**Esri announced a new initiative that will build a collaborative community for R and ArcGIS users.**

R (or formally, the R Project for Statistical Computing) is the fastest-growing environment for statistical computing. In addition to the core R software, it includes more than 6,000 community-contributed packages for solving a wide range of statistical problems, including a variety of spatial statistical data analysis methods. It is widely used by all types of environmental scientists as well as statisticians.

Because R has limited data management and mapping capabilities, many R users have found using R and ArcGIS together beneficial. There has been a significant increase in interest in the use of R with ArcGIS.

The success of Duke University's Marine Geospatial Ecology Tools (MGET) provides evidence of this interest. MGET, a free, open-source geoprocessing toolbox for solving a variety of marine research, conservation, and spatial planning problems, plugs into ArcGIS for Desktop.

Based on feedback from ArcGIS and R users about their needs and techniques for integrating ArcGIS and R, Esri has started a community for developing and sharing useful tools and promoting learning and collaboration. This community will include a repository of free, open-source R scripts, geoprocessing tools, and tutorials.

The community of tools will be user developed and user driven. "Esri will develop a few sample toolboxes and tutorials, but our primary interest is to facilitate the community and help users build what they find useful," said Steve Kopp, Esri senior product engineer on the spatial analysis team.

"This project is about helping the ArcGIS and R users

become more successful in combining these technologies. This community will be important and useful for R users who need to access ArcGIS data, for ArcGIS users who need to access R analysis capabilities from ArcGIS, and for developers who are familiar with both ArcGIS and R and want to build integrated tools or applications to share with the community," according to Esri chief scientist Dawn Wright.

A component of this effort is the R–ArcGIS Bridge. This is a free, open-source R package that allows ArcGIS and R to dynamically access data without creating intermediate files on disk. It was built to improve the performance and scalability of projects that combine R and ArcGIS, create a developer experience that is simple and familiar to the R user, and enable an end-user experience that is familiar to the ArcGIS user.

The R–ArcGIS Bridge allows developers who have experience with R and ArcGIS to create custom tools and toolboxes that integrate ArcGIS and R for their own use and for building toolboxes to share with others, both within their organization and with other ArcGIS users. It allows ArcGIS users to integrate R into their workflows without necessarily learning the R programming language directly.

For R users who don't use ArcGIS but need to be able to work with GIS data, the R–ArcGIS Bridge will give them direct access to ArcGIS data without creating intermediate shapefiles or tables and without requiring them to know how to use ArcGIS. R developers can save R results back to ArcGIS datasets and tables and easily convert between ArcGIS datasets and their equivalent representations in R.

The R–ArcGIS community samples, tutorials, and bridge are available from a public GitHub community site that is similar to other Esri open-source projects. ♦





Welcome address by Agendra Kumar, President, Esri India



Rajesh C Mathur, Advisor, Esri India chairing conference sessions



Keynote address by Rajendra Pawar, Chairman, NIIT Ltd.



Keynote talk by Jack Dangermond, Founder & President, Esri Inc.

# Creating Our Future at Esri India User Conference 2015

Government has announced several programs to bring India on a global forefront. Whether its Smart City or Swachh Bharat, AMRUT or Digital India, Geographic Information System (GIS) technology is expected to play an instrumental role in helping us as a nation to achieve this vision. Recognizing this, the theme of 16th edition of

Esri India User Conference (UC) held at Delhi from 3-4th December 2015 was **"GIS: Creating Our Future"**.

The UC, country's largest GIS event, brought together thought leaders, strategists, policy makers, researchers, academicians, software developers and professionals

Arvind Thakur, CEO, NIIT Technologies launching the case study booklet







Esri India exhibition booth

working in the GIS and ICT space. The conference showcased the role of GIS in shaping India's future through Government's visionary programs. Mr. Jack Dangermond, Founder and President, Esri Inc delivered the keynote talk titled "Applying Geography Everywhere." He said that in the next two decades, GIS would guide all human actions. Real time monitoring of each and every event would become all the more important. GIS is evolving and a whole new pattern of Web GIS is beginning to emerge, he added.

The conference had structured tracks on Smart Cities, Smart Governance, and Disaster Risk Management that

saw some eminent speakers like Shri. J Satyanarayana, IAS (Retd), Advisor, Govt. of Andhra Pradesh, Dr. D S Meshram, President, Institute of Town Planners India (ITPI), Dr. Basantha Sreshtha, Director Strategic Cooperation, ICIMOD, Dr. Vishnu Chandra, DDG & AFA, NIC, Prof. Vinod Menon, Former Member, NDMA amongst others. This year a new thought leadership series was kicked off in the memory of Roger Tomlinson, also known as "Father of GIS". Dr. Shailesh Nayak, Former Secretary of Ministry of Earth Science delivered this memorial talk titled "Towards Blue Economy: Role of GIS".

More than 1000 delegates attended the event





IIT Mumbai team the winner of mApp Your Way app development challenge



A day before the conference i.e. on 2nd December, Developer Summit for GIS and non GIS developers was also organized. The developers explored Esri APIs that are available for creating mapping applications or adding mapping capabilities to existing applications. A concurrent seminar on Enterprise Data Production & Dissemination System was also held for National mapping organizations responsible for mapping, imagery, statistics,

Making the Difference award to DoIT&C, Rajasthan



Special Achievement in GIS award to IMD



surveying, cadastre, and land administration. It provided the attendees greater understanding of the essential information and technology that agencies need to underpin their foundational geospatial datasets. In addition there was a seminar on Systems Architecture Design Strategy targeted at Senior IT and GIS Managers that presented a system design methodology that promotes successful GIS operations. The final day of the conference had break-out

Special Achievement in GIS award to CWC



Special Achievement in GIS award to RJIL





sessions on technical exposition, paper presentations and mApp Your Way. Technology Exposition showcased the latest in ArcGIS technology - 10.3.X and 10.4, including areas devoted to 3D, imagery, cloud apps and newly introduced developer tools.

The delegates experienced new capabilities of ArcGIS Pro, CityEngine, 3D Analyst and how to take advantage of the new 3D Runtime.

36 papers were presented users across themes - Natural Resource Management, Disaster Management, Urban and Infrastructure, New Technology and e-Governance.

A new track called mApp Your Way was introduced this

Esri India Technology Exposition

year where finalists teams who participated in the GIS based app development challenge organised by Esri India presented their innovative applications. The contest offered the university level students to use GIS and build socially relevant Apps. Five finalists selected from IIT Bombay; Anna University, Chennai; Central University Karnataka and University of Petroleum and Energy Studies, Dehradun (2 teams) presented their apps at the event. The winner for the challenge was IIT Bombay for its crowd sourced route navigation and pothole monitoring application.

There was a buzzing exhibition floor where Esri India and various other partners like IBM, HERE, HP, Trimble and Cybertech displayed their offerings. ♦



Participants engaging with Jack Dangermond and Rajendra Pawar





# Getting the Results You Want from GIS

As GIS technology moves to the Web and becomes increasingly intuitive for non-GIS professionals, the technology is transforming how organizations do business. For managers, the challenge is to set high expectations and encourage their GIS team to work with all departments to create and innovate.

Chris Cappelli, Esri's Corporate Director, shares some tips from his own experiences on how organizations can establish a collaborative environment that delivers the results desired.

- 1 Leverage GIS as an enterprise asset.**  
GIS isn't just for a few departments within your organization. Treat GIS as a resource for all your departments.
- 2 Focus your GIS professionals.**  
Let your GIS team members know what the priorities are for your organization and work with them to define how they can deliver on those priorities.
- 3 Empower everyone with maps.**  
Some departments will enviously have a harder time envisioning how they can use GIS technology. Show them how maps can work for them.
- 4 Create a destination portal.**  
We all have portals that we go to in our personal life for information, like travel websites or reviews of consumer products. Portals have tremendous value in turning data into information that employees can depend on to do their jobs.
- 5 Integrate with your other mission systems and data assets.**  
Whether it's an enterprise resource program (ERP) for budgeting and cost accounting or a work order management system for tracking projects, such systems need to be integrated and work together. Stand-alone systems that don't work with other systems in your organization add little value.
- 6 Configure off-the-shelf software as a platform.**
- 7 Get involved personally.**  
Use maps, apps and dashboards and let your GIS team know what you like and don't like about the product.
- 8 Create map series that are tied to your business objectives.**  
Use the series to look for leading and lagging indicators associated with your business objectives.
- 9 Organize effectively.**  
Have good people working throughout your organization and give them the support they need to innovate.
- 10 Promote a culture of sharing and collaboration.**  
In any organization, it's easy to become overly focused on tasks directly related one's job. As a leader of your organization, remind people that they are an important part of a larger mission and help them see how working together can have an even greater impact. ◆

# Choosing the Right Platform

With Esri's ArcGIS SDKs and development tools you have the opportunity to develop robust location-based applications for just about any modern platform. Esri provides solutions that address native and web development targeting mobile (Android, iOS, Windows/.Net) and desktop (Java, Windows, Linux, OS X) platforms and devices. Using the ArcGIS API for JavaScript you can deploy your app anywhere a compatible web browser runs. Solutions can be built with no code for non-developers, and minimal coding for developers (Web AppBuilder, AppStudio), and SDKs that allow developers to build one codebase and deploy it (Qt, Xamarin, .Net, Java, JavaScript).

## How do you choose?

ArcGIS software development patterns are similar at a high level across ArcGIS Runtime SDKs and ArcGIS Web APIs. When choosing an approach for creating applications with ArcGIS capabilities, it's helpful to have an understanding of the general differences between native and web apps both in general and regarding ArcGIS capabilities.

- Native strategies offer the best device integration and the most out-of-the-box functionality for connected and offline workflows, but they require native development skills. You can use ArcGIS Runtime SDKs

to create native apps.

- Web strategies use HTML, JavaScript, and CSS hosted on a web server and delivered to the user's device or desktop using its web browser. This strategy is best if you don't know the devices your users have and you need to reach a wide audience. You can use ArcGIS API for JavaScript in a web strategy.

## Comparison points

The most important goal is to deliver the best experience and functionality for the audience of your app. The following are questions to consider helping you choose the right platform for your app:

- Who is the target audience (internal or consumer public) and what functionality (mapping, advanced analysis, and so on) is required to support the application?
- Are your users sometimes disconnected and need the app to run offline?
- What skills does your current development team have?
- What data and web services are required to support the application?
- Are there requirements for device integration, such as use of the device's GPS, compass, media, calendar, contacts, text messaging (SMS), notifications, and so on?

## General differences compared

Consideration	Native strategy	Web strategy
Which devices do your users prefer?	Target each OS and deliver the best native experience. This means writing an app for each OS or taking advantage of cross-platform development options.	Build a single web application for all devices.
What skills do you have?	Requires skills developing on each native platform (for example, Objective-C for iOS, Java for Android, and .NET for Windows). However, several Runtime SDKs provide cross-platform development options.	Requires HTML, JavaScript, and CSS knowledge.
Do you want to distribute the app through a store (App Store, Google Play, Windows Store, Amazon)?	Distribution through a store is supported.	Distribution through a store is supported with use of additional frameworks [1]
Access to device utilities	Access to all device utilities (GPS, compass, calendar, media, contacts, camera, and so on)	Limited to HTML5 mobile features.
Maintenance on multiple devices and desktops	App updates require ad-hoc, enterprise, or store distribution.	When you update your app, it is immediately available to all devices.

1. ArcGIS API for JavaScript lets you distribute your app in a browser and a hybrid app on multiple platforms with PhoneGap, Apache Cordova™, Intel® XDK, Trigger.io, or Electron.

## ArcGIS capabilities compared

Consideration	Native strategy	Web strategy
Will users need to use the app and data offline?	Offline use is built-in and includes offline map viewing, editing with sync, geocoding, routing, and analysis.	Some local storage is possible with HTML5. Offline operation is possible but can be difficult.
Routing and geocoding	Online and offline are supported. Requires ArcGIS for Desktop to author offline data sources.	Requires network connection
GeoEnrichment (demographic and landscape variables)	Requires network connection	Requires network connection
Geometry operations like clip, buffer, intersect, simplify, union, and split	Offline is supported and recommended.	Client-side supported
Model-based analysis (geoprocessing) [1]	Supported online, offline, and supported using Local Server[2].	Requires network connection
Geometric network tracing [3]	Supported online, offline, and supported using Local Server[2].	Requires network connection
Advanced cartography and symbology including support for rotation, offset, vector/font based symbols and military symbology (2525C and APP-6B support)	Fully supported	Rotation and offset.
Display and animate large numbers of features	Display and animation while maintaining smooth and fast map navigation is fully supported.	Supported but not recommended for large numbers.
Local file-based data (shapefiles and imagery) offline	Offline and local access to shapefiles and imagery is built in.	Not supported

1. Build models in ArcGIS for Desktop, and provide clients analysis through geoprocessing services.
2. Local Server is available on Windows and Linux in the ArcGIS Runtime SDKs for .NET, Java, and Qt.
3. Supported through model-based analysis (geoprocessing service), for example, valve isolation trace.


## Cross-platform development with ArcGIS

Several ArcGIS SDKs let you write once and deploy to multiple platforms in the following ways:

	Android	iOS	Windows	Mac	Linux
ArcGIS Runtime SDK for Android	✓				
ArcGIS Runtime SDK for iOS		✓			



	Android	iOS	Windows	Mac	Linux
ArcGIS Runtime SDK for Java [1]			✓		✓
ArcGIS Runtime SDK for .NET [2]			✓		
ArcGIS Runtime SDK for OS X				✓	
ArcGIS Runtime SDK for Qt [3]	✓	✓	✓	✓	✓
ArcGIS Runtime SDK for Xamarin[4]	✓	✓			
ArcGIS API for JavaScript [5]	✓	✓	✓	✓	✓
Web AppBuilder for ArcGIS [5]	✓	✓	✓	✓	✓
AppStudio for ArcGIS [6]	✓	✓	✓	✓	✓
ArcGIS REST API [7]	✓	✓	✓	✓	✓

1. ArcGIS Runtime SDK for Java supports cross-platform development for Windows and Linux desktop systems.
2. ArcGIS Runtime SDK for .NET supports building applications for Windows desktops, the Windows Store, and Windows Phones from a single codebase.
3. ArcGIS Runtime SDK for Qt lets you write once and deploy to Android, iOS, Linux, OS X, Windows, and others. Code written using the QML API must be compiled native for each target platform, but it is the same code for each platform. There are no differences in the Qt QML API or Esri Runtime for Qt between platforms, making cross-platform application development with a single code-base possible. To achieve this there are some compromises. For example, the UI controls available must exist on all platforms, meaning that specific UI components that only exist on one platform cannot be used when building cross-platform code. However, for a large percentage of use cases, the QML API will be a good choice.
4. ArcGIS API for Xamarin, the SDK that supports building native mapping apps for Android and iOS in C#, is currently in Technical Preview.
5. ArcGIS API for JavaScript lets you distribute your app in a browser and a hybrid app on multiple platforms with PhoneGap, Apache Cordova™, Intel® XDK, Trigger.io, or Electron.
6. AppStudio for ArcGIS apps can be extended using the ArcGIS Runtime SDK for Qt.
7. ArcGIS REST API allows you to use web services in any platform capable of issuing HTTP requests. 

## A word about hybrid strategies

Hybrid strategies use a mix of native components and web app content (HTML, JavaScript, and CSS) to build native applications and distribute with enterprise or app store deployment. One approach is to embed a web view into a native app and load web content. More advanced strategies include leveraging HTML5 with frameworks

supporting richer integration with the native platform (for examples see [4] above). Today, Esri's SDKs and APIs are designed for and address pure web and pure native development patterns. Esri does not provide specific hybrid frameworks for hybrid application architectures.

# 5 Ways to Get the Most out of Your GIS Platform

**Today, ArcGIS is more than a software product. It is a platform that takes advantage of organizations' huge information inventories.**

Platforms have changed the way society shares information, communicates, and collaborates. From Amazon to Apple, a variety of platforms on our devices remember who we are and call up the information we need to get the most out of our time. We move seamlessly from desktops, web browsers, tablets, and smartphones. Wouldn't it be great if our professional platforms worked so smoothly?

As the industry standard in GIS, the ArcGIS platform gives you a three-part information system that transforms your data into actionable intelligence.

The ArcGIS platform has three parts:

## **The Portal (ArcGIS Online, Portal for ArcGIS, or hybrid)**

The portal is the hardware and software that connects your people, so they can obtain the geographic information they need.

## **Server and Online Content Services**

This is where internal information and third-party data resides.

## **The Clients**

Everyone in your organization can access this information from desktop, web, and mobile devices.

This three-part structure makes it easy to collect and communicate critical information to and from everyone in your organization, from your mobile workforce to executives in the board room and external stakeholders beyond.

Keep reading to learn how to get the most out of your spatial platform. You're five steps away from success.

## **1 Implement the Platform Now**

Most organizations still view GIS as a traditional client/

server application. This means they implement ArcGIS for Desktop and ArcGIS for Server. Sharing is possible but more difficult. They implement nearly all spatialized applications within ArcGIS for Desktop or as custom web apps via ArcGIS for Server. They then build out their data model schema to be all inclusive. The data model becomes more and more complex while support becomes more difficult.

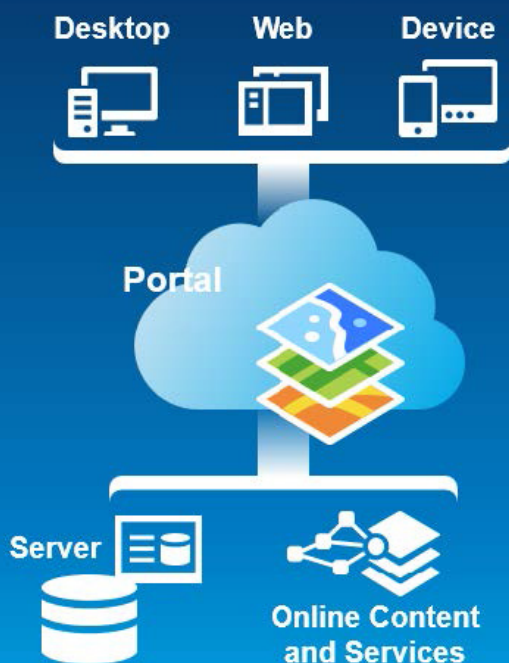
To begin implementing the platform, set up your portal, either ArcGIS Online or Portal for ArcGIS or a hybrid, and then create your organizations and groups. Give your colleagues access and permissions to these, and the portal is ready to go. You can publish your data to the portal as an Esri web map even without deploying the latest technology. The web maps enable you to share, collaborate, and communicate your data to anyone—on any device, anywhere. Web maps point back to your authoritative data. You can embed them directly into your website via the ArcGIS platform, making it easy to get your organization's authoritative data to the right people in the company.

Editing data takes place as it did before the platform; there is no change. It just works with the platform now.

## **2 Upgrade to the Current ArcGIS for Desktop Version Recommended for Your Organization**

Because it's critical to keep current, upgrade to the latest version of ArcGIS for Desktop, which focuses on your workflows. This version directly addresses what users and partners identified they needed out of ArcGIS for Desktop. For instance for utilities, ArcGIS 10.2.1 for Desktop includes updates for reconcile and conflict management, the geometric network, and replication.

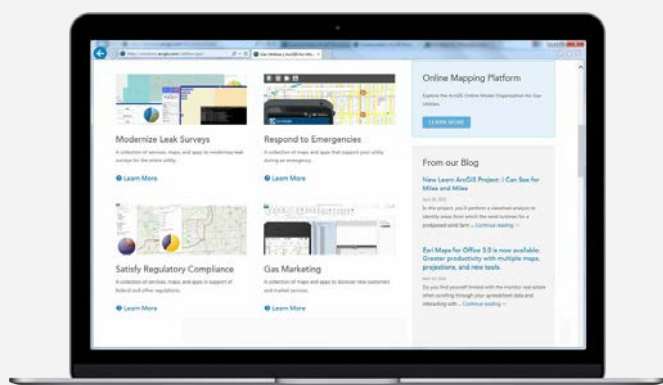
Esri developers therefore recommend utility and telecommunication users keep using ArcGIS 10.2.1 for Desktop as they continue to build patches for this release. In addition, they recommend users keep current with other Esri products, including ArcGIS for Server.



### 3 Take Advantage of Template Maps and Apps

The best way to begin leveraging your platform is to download Esri's organizational models from the ArcGIS Resources site. This helps you understand how to take advantage of the focused solutions Esri offers.

The Esri solutions site has numerous template maps and apps available for addressing the common issues facing today's industries. The ArcGIS for Gas Utilities site, for instance, shows solutions for emergency response, regulatory compliance, and leak surveying. And Esri adds to these workflows each month. Visit [solutions.arcgis.com](https://solutions.arcgis.com) to obtain best practices.



### 4 Take a Look at ArcGIS Pro

ArcGIS Pro is Esri's latest addition to the platform. It is a standalone desktop application that runs alongside ArcGIS

for Desktop. Organizations can use ArcGIS Pro for 2D and 3D mapping, creating projects and tasks, performing spatial analysis with simple wizards, and generating web maps.

### 5 Spatially Enable Your Real-Time Data

Sensors are increasing rapidly, enabled by the Internet. The ArcGIS platform brings all your real-time data into maps, providing an intuitive approach to understanding your organization in real time. You can show critical live data, such as in the case of utilities, real-time crew locations, advanced metering infrastructure (AMI) customer data, and SCADA and distribution management system (DMS) feeds—all on a map. You do it by using Esri's ArcGIS GeoEvent Extension for Server. Best of all, you can access this map from any device.

### Upgrade. Explore. Go Pro.

Benefit today from the platform by making sure your systems are upgraded. Explore preconfigured Esri maps, apps, and templates. Go pro with ArcGIS Pro and extensions including ArcGIS GeoEvent Extension for Server, so you can get the most out of the latest technology, including 3D mapping and real-time data integration. You're already a pro. Make sure your whole organization can be, too. 📌



# Vision to Reality: How Reliance Jio used GIS to build India's largest

# 4G Network

Reliance Jio promises to shape the future of India by providing end-to-end digital solutions for businesses, institutions and households; seamlessly bridging the rural-urban divide. Jio aims to enable this transformation by creating cutting-edge voice and broadband network and a powerful ecosystem on which a range of rich digital services will be enabled.

Jio envisions an India where broadband networks, affordable smartphones, availability of rich content and applications are basic necessities consumed in abundance, equally by individuals and businesses, in far-flung villages and large cities, in line with the Government of India's 'Digital India' vision. To realize this vision, Reliance Jio embarked on creating a complete ecosystem comprising of future proof infrastructure, services, service delivery platform and service access mechanisms.

To begin with, Jio created an extensive, future-proof, end-to-end, all-IP network across India to provide next generation digital services. Jio acquired pan India spectrum in 2300 MHz, 1800 MHz and 800 MHz bands in all Telecom circles of India investing over US \$ 5 Billion. Jio has planned over 100,000 4G LTE cellular sites. Jio has also laid more than 250,000 km of fibre-optic cables, covering 18,000 cities and over 100,000 villages, with the aim of covering 100% of the nation's 1.25 Billion population by 2018. FTTx Network will have 250,000 km of additional optical fibre over next 2 years. This network has an initial capacity to serve in excess of 100 million wireless broadband and 20 million Fibre-to-Home customers.

## Challenges

Building a green-field all-IP telecommunications network is a highly capital intensive process involving multitude of stakeholders like Network Planners, RF Engineers, Real Estate, Construction, O&M, Business, Projects and Finance personnel. Typical challenges faced by RJIL were:

- How to plan, build and manage this extensive network by project teams spread all over India?
- How to plan optimal RF Coverage using multiple frequency bands to ensure consistent and seamless

service quality? How and where can technologies like Small cells and WiFi networks be used for traffic and cost of access optimization?

- How to specify, identify and manage network assets throughout their life-cycle?
- How to optimize both wireless and fibre networks during planning stage?
- How to acquire sites and RoW? How to manage paperwork, funds and title during / after acquisition?
- How to track project progress from scope release to Construction to Testing and Commissioning?
- How can multiple stakeholders across the organization participate in the extensive, end-to-end workflow in a collaborative but hierarchical manner for approvals of various types? How can everyone view and share the progress at each level?
- How to efficiently gather the field data and convert it to telecom inventory?
- How to create physical and logical inventory in a smart, automated manner ensuring maximum data flow-through and minimal manpower for end-to-end OSS operations?
- How to improve outage management efficiency to minimize network down-time, MTTR and manpower requirement?

## Solution

Realizing the potential of geospatial technology, Reliance Group has been an early adopter of ArcGIS in several of their businesses. As such, use of ArcGIS Platform was preordained in Jio project. An enterprise level GIS was implemented at Reliance Jio, spanning multiple departments, thousands of users including planners, engineers, field workers and decision makers.

Highly experienced Jio GIS Team designed system architecture, geospatial data structure and application framework especially suited to Telecom industry so that ArcGIS became one of the foundation layer application platforms for Jio business. The solution also ensured implementation of telco-specific, end-to-end workflows to ensure systematic build-up of data ensuring only incremental efforts at each stage.



GIS was integrated with IT systems such as SAP ERP, CRM, BSS and Document Management System, Telecom specific applications like Atoll RF planning, Ericsson's NetworkEngineer & Granite Inventory, HP's Service Manager etc. ensuring end-to-end process management. Majority of the solutions are ArcGIS Server based web applications or mobile apps using Esri SDK. In recent times, most of these solutions are being migrated to Portal for ArcGIS ensuring that Jio's Enterprise GIS is in step with latest Esri geospatial technology.

## Enterprise Services – Building a common foundation for all

To ensure consistent referencing across all teams, a common base map service "RMaps" along with routable road network service was developed. RJIL developed custom geo-locators to find landmarks, Pols and their telecom facilities which is used extensively in all applications. In addition, services like Monsoon Progress helped ensure consistent planning and risk analysis across impacted areas.

## Optimal RF Network Planning

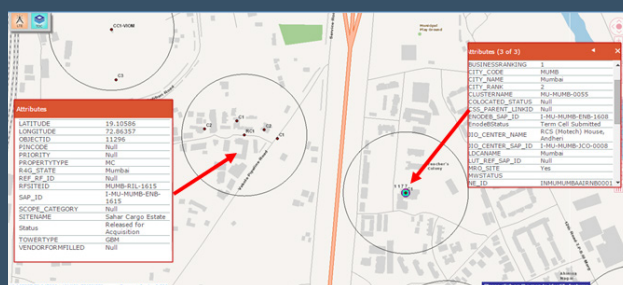
Coverage created by Atoll RF planning tool is smoothened and projected using complex geoprocessing tools to visualize coverage in the spatial context and arrive at the right number of sites and their location. Based on the requirement and availability of sites with existing infrastructure providers, Jio professionals take decisions to own, build or lease facilities from other tower companies at required location. This has resulted in substantial reduction in CAPEX for the project.



## Wireless Planning

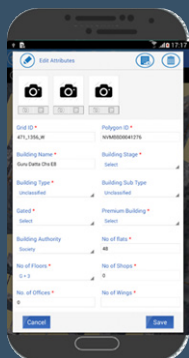
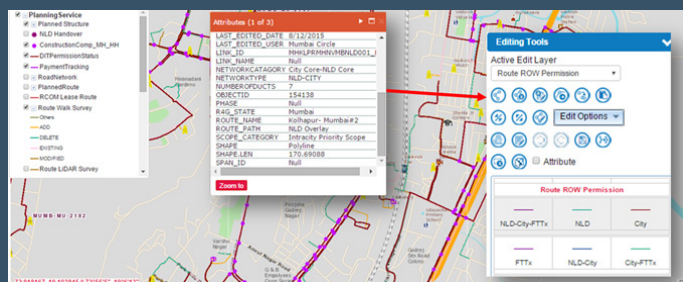
ArcGIS Workflow Manager was used to define an end-to-end, LTE Network Plan to Build project workflow. The extensive workflow comprises of 108 steps such as candidate identification, surveying, negotiations and acquisition, various stages of construction, testing, commissioning and optimisation. RJIL's LTE Workflow handles **more than 100,000 Cell Sites each with more than 250 different set of activities**. The workflow is integrated with SAP ERP for FiCo functions, Documentum system for all lease / purchase documentation, Ericsson's NetworkEngineer for inventory and other enterprise GIS systems.

Use of this application during the project phase has not only resulted in saving of huge costs due to efficient workflow and avoidance of redundant site acquisition but, in fact, it would have been impossible to execute project of this magnitude across the whole country in the given timeframe without such an application.



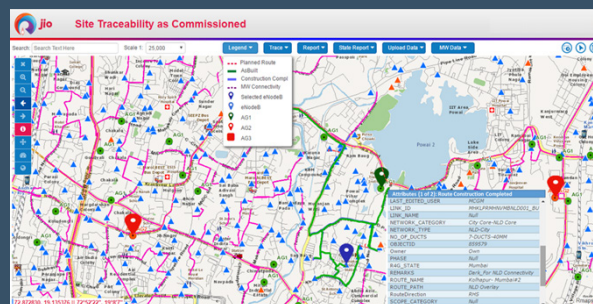
## Optimal Wireline Network Planning and Inventory Management

ArcGIS Desktop and web applications with RMaps, routing and geo-locator services are used for OFC route and network planning. NetworkEngineer is used to model telco equipment, create physical and logical inventory for both ISP and OSP areas using connectivity to trace the network. Fibre to the home allows provisioning much higher bandwidth, rich content and applications to consumers.



FTTx network planning requires accurate land base with demand estimation (home-passes and purchasing power) through field survey. In Jio, FTTx survey is carried out using Esri Mobile SDK based mSurvey application and captured field data is directly updated in GDB. Other wireline applications are also used in FTTx

the planned and commissioned network. It allows network planners and operations staff to visualize Jio's all-IP network on map through 3 logical telecom layers – access, aggregate and core – during planning and operations



Mobile based progress monitoring dashboard for senior management to quickly review all important project KPIs in various geographic areas covering all modules – wireless, wireline and FTTx was developed.

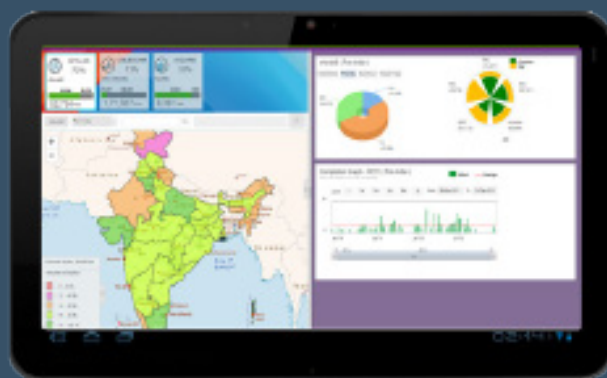
## Network Construction

No network design changes are allowed without update in GIS system with appropriate approvals. Link drawings and Construction Work Orders are issued using GIS application and ERP integration. As-Built network quantities are tallied with planned GIS route to ensure compliance, tracking and cost control. Esri Mobile SDK based Android apps were developed for As-Built data collection by field personnel. Paper-based As-Built mark-up and web based As-Built update in conventional manner is also available where mobile survey is not possible.



## Project Progress and Spatial Inventory Management

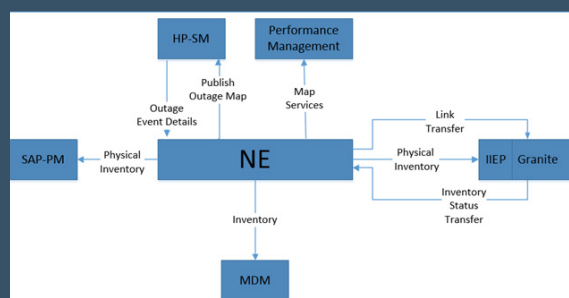
Web based tools for Spatial inventory management are developed to manage the inventory data and perform detailed analysis which helps in decision making. Site traceability is one the most useful functionality to trace



## Service Provisioning and Assurance

GIS is not only being used for efficient Network planning but also is a mandatory input for Service Provisioning performed on Ericsson's Granite platform which is tightly integrated with NetworkEngineer, a dedicated Telco solution on Esri platform.

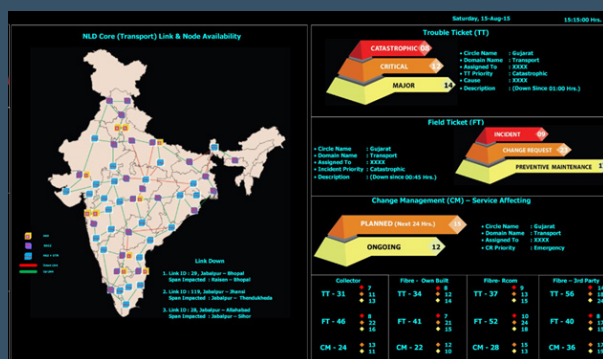
Similarly, Service Assurance functions on HP platform extensively use various map and data services published from GIS platform for performance management and outage management.





## Network Operations

Network Operations Centre at Reliance Jio is laid out with several rows of desks, facing a video wall depicting geographic and schematic status of network and KPIs to monitor performance and availability of pan-India network. GIS and NetworkEngineer based analytical reports and maps facilitate this critical function at Jio.



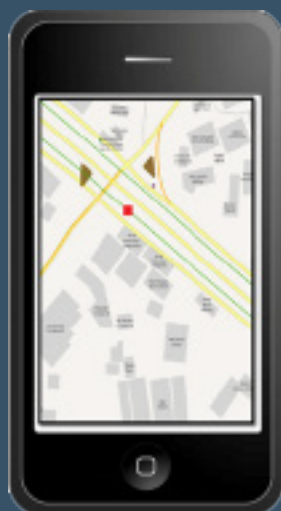
## Benefits

Geospatial technology and ArcGIS platform have helped Reliance Jio to efficiently build an modern and extensive 4 G telecom network comprising of more than 250,000 kilometres of fibre-optic cables, covering 29 states, 18,000 cities and over 100,000 villages with an initial capacity to serve in excess of 100 million wireless broadband and 20 million FTTx customers through more than 100,000 facilities.

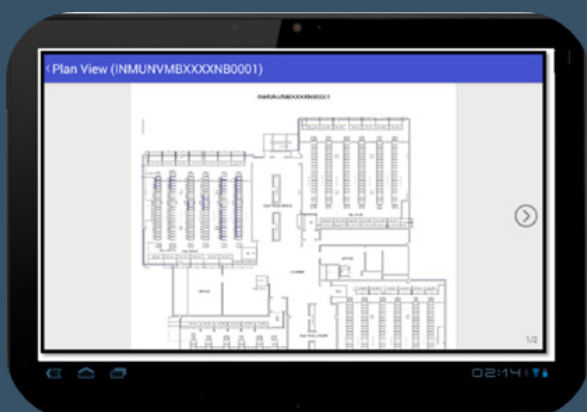
Jio estimates direct savings and productivity improvement of over Rs. 300 million during network build phase itself due to use of GIS for network planning, analysis and optimisation. Jio has also observed 2-3 times improvement in MTTR in field operations. This would result in payback of investment during project stage while continuing benefits during steady state operations will more than justify investment in GIS.

Jio services will be launched in the second quarter of 2016 when additional public-facing GIS applications will help improve customer satisfaction. ●

## Field Operations



To operate and maintain the inside plant (ISP) and outside plant (OSP) network in field, mobile and web based applications tightly integrating Network Engineer, Granite, HP-SM and fiber fault management systems are deployed for use by NOC and field users. These applications have resulted very quick restoration time and update of the As-Built network data after such repairs.



## Customer Speak

“ Our successful GIS implementation has holistically addressed challenges of telecom network management through end-to-end, process based, integrated geospatial solutions, allowing collaborative work resulting in huge CAPEX savings and very high ROI. ”

Milind Deshpande, Sr. Vice President,  
GIS & NE Reliance Jio

# VayamTech Smart City Management Solution

## Solution Summary

Vayam Technology's smart city solution based on GIS technology enables integration with different smart city components like transport, safety, citizen services, asset management, disaster & emergency management. The solution based on Esri ArcGIS technology supports advanced automation and real-time integration of city monitoring and management system. The solution offering varies from Geodatabase creation in 2D and 3D format to integrate these solutions with Smart Applications and devices for Spatial Decision Support and Action.

## Solution Description

The solution uses ArcGIS desktop for data creation, ArcGIS online and Geo event Processor.

The ArcGIS Technology provides the base for the SMART city right from the Geodata generation to the Smart Application integration on different platform with spatial analysis. This spatial analysis provides a cognitive intelligence for Action and Decision support.

## Solution Components

- Traffic and Transportation
  - Transit management system for City Transport system, whereby the vehicles are tracked on real time basis over the GIS maps and registration of emergency calls from the vehicles.
  - Generation of Traffic details of the road and Geospatial analysis of the problems in terms of infrastructure gaps, like points of bottlenecks, accident points etc.
  - Integrated Traffic management in real time using sensors which sends real time data of traffic and the GIS integrated analytics for decision support related to traffic like managing signals, route diversion etc.
- Security and Surveillance
  - Integration with Emergency Management system. If a distress class is made from any geographic location, the address may be traced over the map and simultaneously another GIS system can track the nearest patrolling vehicle equipped with GPS system. The emergency location may be immediately transferred to the dashboard installed in the vehicle with instructions for necessary actions. The dispatch may be also made on handheld devices of police.
  - Surveillance system through video analytics enabling 24 hours monitoring through CCTVs and projecting that over GIS Map for location based analysis and spatial coverage
- Integrated Work Flow system for Urban Land management for land use management by development authorities
- GIS based integrated e-governance services for municipality for
  - Online tracking of tax payers and non-tax payers
  - Citizen's grievance redressal: Compliant registration location and workflow management supporting decision support
  - Waste management
  - Tracking functioning of electric poles and other utilities.
  - Tracking development in city as per city planning norms.
  - Effective City service provision by sending the detailed locations to service crews for maintenance and management of services
  - Different municipal service provision status, like schools, health, bus stops etc.

- Asset management of utilities.
  - o The solution helps create comprehensive inventory of utility network components and their spatial locations. It provides the capability to monitor and explore the health of the network by generating alerts for scheduling maintenance, testing and replacement of assets under Smart city and this can be integrated to mobile application for task allocation to the field crew.
  - o The Utilities may also integrate the live data received from SCADA system with GIS systems for day today asset management.
  - o GIS based Asset management solution also projects the demand and supply and the gaps in the network.
  - o The complete solution may be availed by any of the utilities like water supply, storm water drains, sewage system, electricity, city gas services and telecom services.

## Key features

- Advanced map visualizations, highlight concentrations and enables interactive analyses
- Enterprise GIS for Asset Planning, Management, operation and maintenance.
- Integrated Workflow Systems
- Geospatial database integration with products and applications such as billing and smart meters.
- Publishing of the thematic maps for actions by various departments
- Live Spatial Information generated by integration with Smart Devices using Geo-Event processor
- GIS integrated analytics for performance monitoring of services

## About VayamTech

M/s Vayam Technologies Limited (Vayamtech) is one of the fastest growing and a leading Information Technology organization in India providing end-to-end IT solution and services to clients from different areas / sectors viz. Government (Centre / State), PSUs and Corporates. Founded in 2000 and headquartered in New Delhi (India), the company has turnover of more than 600 crores during FY 2014-15.

Vayamtech Technologies Limited is an SEI CMMI level 5, ISO 9001:2008, ISO 27001:2005 and ISO/ IEC 20000 certified IT Solutions Company. Vayamtech has proven tools and methodologies utilized over more than 200 successful engagements. We utilize our experience in large scale e-governance projects and bring value to our customers with our domain experience, project management and technical expertise. Vayamtech offers an integrated portfolio of IT and IT enabled services delivered through a proven GLOCAL (Global and Local) model. 🌟





# Electoral Data Analysis & Management

## A GIS based Electoral Management solution

### Solution Summary

Electoral Data Analysis & Management is a GIS based end-to-end solution that enables all voters and election officers to visualize relationships, patterns, and trends to deeply understand their constituency and manage electoral processes effectively. The stakeholders can access information with respect to all facets of electoral management like voter registration, polling stations locator and election data on demand. The solution has separate interface for citizens and officers.

While the citizen centric interface of this GIS based solution focuses on enriching the voters electoral experience, Election officer interface focuses on the herculean task of election management and monitoring. Through a web-based interface from the home page, election officers are able to access a highly sophisticated GIS Application that enables them to perform a wide array of duties and responsibilities. The solution is a backbone to aid election officers to manage their jurisdictions as well as coordinate operations.

### Solution Description

The solution is based on the state-of-the-art technologies, including GIS and beyond, to bring to the election machinery a system that is easy to use, reliable and immediately accessible.

The solution has separate interface for citizens and officers that refine the electoral experience for voters and enables officers to execute their tasks in a coordinated manner. Through spatial analysis, multiple databases and

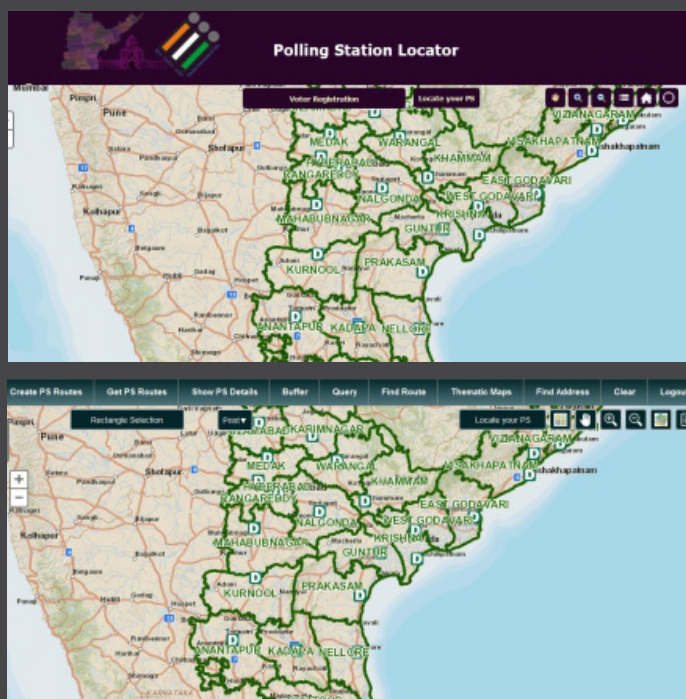
validated data elements, electoral officers and voters are provided access to a full spectrum of information about critical constituents such as voter data, voter registration information, polling stations, personnel posted at each location, directions to polling station clusters and a host of other information available with only a few mouse clicks. The entire solution can be accessed on smartphones and tablet PCs through customizable apps.

### Key Features

- Device agnostic, multilingual, web-based intuitive interface that serves as a complete information gateway for voter and officers
- Capability to query the spatial data and the election data on demand
- Create routes to the polling station on maps and store for future reference
- Create map-based view of several key elements such as district boundaries, locations of polling booths within an assembly constituency as well as a parliamentary constituency and other related data.
- A high level of functionality for officers interface such as base map toggle, map pan, zoom in, zoom out, layer toggle and legend display
- The functionality of the ArcGIS application to help election personnel expertly manage election logistics
- Webcasting feature with live video, to help polling officers monitor the entire voting process and identify any discrepancies

The solution is built using

- Esri ArcGIS API for Java Script 3.7, WCF services, ARC SDE, ARC GIS server 10.2
- J2EE, WebServices, JBOSS Application Server, SQL Server 2008 R2
- iOS, Android, Windows Mobile, PhoneGap.



## Key Benefits:

### Benefits of the Citizen Interface

- **Easy access to information**  
The solution provides instant access to polling logistics information to millions of voters through smartphones, tabs and other access devices.
- **Voter Transparency**  
Registered voters can claim their voter records and even correct any discrepancies by interacting directly with the Election Commission. They no longer need to go through polling agents and other non-governmental support staff with possible vested interests.
- **Multilingual Interface**  
The solution can be customized in multiple languages, thus even voters from remote villages can check their voter records in their vernacular language and take timely action to update their records.

### Benefits of the Officer's Interface

- **Near instant decision-making**  
With millions of bytes of real time data at their fingertips, officers can take decisions swiftly and confidently. The solution provides them direct access to data, which supports their decisions in every way, shape and form.
- **Ease of Coordination**  
The GIS based solution enables hundreds of booth level officers to coordinate with one another in the virtual space by sharing data and forwarding relevant information extracted from one or more of the various databases.
- **Significant Cost Savings**  
The functionality of the GIS technology in the solution helps reduce cost of managing the election logistics.
- **Monitoring**  
Using the webcasting feature polling officers can monitor the entire voting process and identify any discrepancies.
- **Deployment of Polling Personnel**  
The solution facilitates the deployment of polling personnel such as polling officers, staff, security officers and others to manage the election process efficiently.

## About ASMAN

ASMAN Software Solutions Private Limited is a provider of cutting edge software consultancy, design and development services with headquarters in Hyderabad, India. The company made its inception into the IT arena in 2011 and offers a comprehensive range of Software and IT solutions on a wide range of Hardware and software platforms. In partnership with Esri, we create spatial information systems to help accelerate client businesses forward. The broad range of services that are offered includes map customization, custom tool development, application migration, web GIS, mobile GIS etc. ♦

# A Fresh Take on Addressing

Around the world, addressing is inconsistent at best and nonexistent at worst. Latitude and longitude are useful when devices talk to devices, but getting humans to remember geographic coordinates is impractical. That is why what3words, a London-based geocoding startup, is on a quest to readdress the entire globe.

The organization, an Esri emerging partner, has divided the surface of the earth into three-meter-by-three-meter squares and, using an algorithm, has allocated three random words to each one of those squares, yielding 57 trillion unique and unambiguous addresses. The northwest corner of the Washington Monument in Washington, DC, for example, is clubs.grace.hike; Cape Point in South Africa is snooze.cheater.crewmen; and the Pacific Ocean's pole of inaccessibility (the spot that's farthest away from any land) is chefs.gritting.suspected. The service is currently available in five languages—English, French, Portuguese, Spanish, and Swahili—and the team is working to launch 13 more, including Arabic, German, Japanese, Turkish, and Urdu.

"We're really talking to the masses, and we're doing it in a way that's understandable," said what3words director of strategy Steven Ramage, who left his post as managing director of Ordnance Survey International to join the startup. "Being able to communicate location in a very simple, language-based method empowers communities because we can speak the language of that community."

what3words can be used by individuals—to find friends in a park, for example—as well as businesses, governments, and other organizations. A nonprofit conducting an emergency aid mission could use what3words to

communicate the precise locations of remote refugee camps, water distribution sites, and makeshift clinics to workers and partners out in the field. If a utility had 80,000 electricity meters in a database, it could batch convert the latitudes and longitudes of each location into three-word addresses to make it easier for technicians to find them.

"The whole point about what3words is that latitude and longitude can be easy," said cofounder and CEO Chris Sheldrick. "It communicates for the first time over the phone and in writing and reading."

The what3words locator is available as a geocoding service for use with ArcGIS Online, ArcGIS for Desktop, and ArcGIS for Server. what3words has also developed an SDK so developers can build the geocoder into mobile apps.

The purpose of integrating with Esri, according to Sheldrick, is to facilitate communication between ArcGIS users and people around the world. With Esri's aspiration to bring GIS into the mainstream, Ramage envisions that the two companies can work together in a number of ways—from fostering e-commerce in developing countries to continuing to improve smart communities.

"This is elegant in its simplicity," said Ramage. "That's the brilliant part." ◆





# Disconnected Editing with Collector for ArcGIS

Interested in deploying a person or crew of workers to edit your authoritative geographic data in the field without needing a connection to the internet? We are too! Collector for ArcGIS is the perfect client for you if your mobile phone or tablet is an iOS, Android, or Windows device.

Collector for ArcGIS is a lightweight native application that makes offline field collection possible with an easy-to-use interface. While usage of the application is simple, there are several deployment options available which can make getting the initial grasp of Collector for ArcGIS somewhat complicated. Below is a list of some helpful tips and tricks to get you offline as quickly and as smoothly as possible.

## 1 Collector for ArcGIS requires a unique identity.

Collector for ArcGIS requires authentication from a 'named user' account within your ArcGIS Online organization or Portal for ArcGIS. The number of users is determined by the license level of your subscription. Administrators can invite additional users to the organization, or groups can be leveraged to share maps with users from other organizations.

To purchase additional users, contact Esri Customer Services or your Account Manager.

**Tip:** You cannot use a public account to license Collector for ArcGIS.

## 2 Collector for ArcGIS is dependent on a pre-configured web map.

Although you can download the application directly from the App Store, you will not be able to start using the application until a map is authored that contains at least one editing-enabled feature service. If you are the author of the map, it is best to get started by creating a web map in either ArcGIS Online or Portal for ArcGIS.

**Tip:** If it's your first time creating a web map for use with Collector for ArcGIS, familiarize yourself with the following tutorials.

## 3 The web map must be configured for offline use.

Services hosted by ArcGIS Online or Portal for ArcGIS:

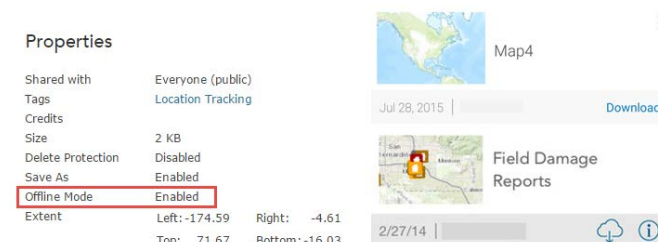
- Feature: 'Sync' operation enabled
- Tile: Export Tile/Offline mode enabled

Services hosted by ArcGIS Server:

- Feature: Stored in an Enterprise Geodatabase, GlobalIDs added, Versioning or Archiving enabled
- Tile: Export Tile operation enabled

**Tip:** To download a web map for offline use, ALL layers in the web map must be confirmed with the sync operation enabled.

**Trick:** In ArcGIS Online or Portal for ArcGIS, you can check your web map for offline use by navigating to the Item Details page of the web map. Additionally, you can check on your device for the option to Download (Android or Windows) or a cloud icon (iOS).



## 4 Synchronize as often as possible.

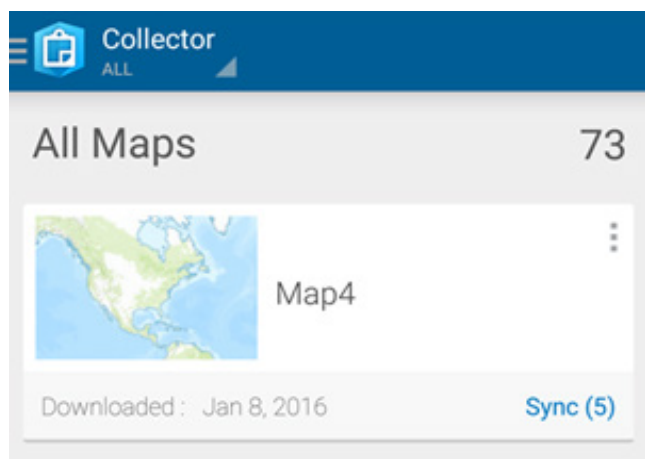
Frequent synchronization reduces the amount of data that gets pushed back to the server at once, which reduces the chance of a synchronization failing.

**Tip:** If you are using ArcGIS for Server and need to synchronize large amounts of data, consider increasing the upload size, which by default is set to 2 GB. You may also need to increase the upload size of your web server to accommodate large synchronizations.

## 5 Use the strongest network connection available.

Public WiFi, for example, is not a best practice for synchronizing because you cannot trust the source; the network bandwidth or restrictions may not be capable of processing the request. If possible, synchronize when connected to a trusted source, like the internal WiFi of your organization. Collector for ArcGIS sends 2 MB bundles of data at a time during the synchronization process, so the strength of the network connection becomes more important as the size of the data increases.

**Tip:** If your offline data fails to synchronize successfully the first time, test it again using a different network.



**Trick:** You can configure Collector for ArcGIS to only push edits up to the server when you synchronize, and to not pull down edits made by others while you are offline. This reduces the amount of data transferred, making it faster to share your changes and save on data transfer costs from cellular networks. If the edits being made by others are important to you, leave 'Push Only' synchronization disabled.

### Push Only

When working with On-Device maps, push my edits but don't pull edits from the server.



## 6 Consider the data.

Simply put: the more data, the slower the performance. That being said, sometimes performance decreases are less obvious than just the number of features in the data. For example, the number of fields, relationship classes, the projection, and the visibility scale can all affect performance. If you are looking to improve performance, you can hide fields, ensure the projection of the data matches the basemap, and set a reasonable visibility scale on the data or within the web map.

**Tip:** Keep in mind the number and size of photo attachments that you are collecting. Photo attachments cause the data to expand due to the size of each respective photo. When synchronizing many photos, it is especially important to have a strong network connection.

**Trick:** You can limit the size of photos that you attach to features within Collector for ArcGIS on the Settings page.

**Tip:** The next release of Collector will support new offline settings that authors can adjust in ArcGIS Online on the item properties pages of their web maps. These settings will allow map authors to specify what types of information field workers retrieve from the server for both editable and

read-only layers. As a result, workers can sync less data, which can decrease the risk of sync failure.

### PREFERRED ATTACHMENT SIZE

#### Actual

Full Resolution

#### Small

240x320

#### Medium

480x640

#### Large

960x1280

#### Extra Large

1126x1500



## 7 Test before deploying to the field!

Create a sample web map and try collecting data and synchronizing the edits before taking the map into production. Collector for ArcGIS is supported on iOS, Android, and Windows; you may find that an issue is specific to the hardware or to the operating system of your mobile device. If you are unable to synchronize from your sample map, please contact Esri Technical Support. 📌

## Add tweets to your web map

Twitter is a free social networking microblogging service that allows users to broadcast short posts called tweets. It's used widely by individuals, as well as federal and local government agencies, organizations, and businesses. Tweets can include location (a user account setting), and those that are can be placed on a map, adding an extra dimension of information.

Public Information is a fully configurable and responsive template that adapts to any form factor – browser, tablet, or phone. It includes the ability to map tweets and other geolocated social content from Instagram, Flickr, YouTube, and Webcams.travel. The template can be configured to automatically include a search string to retrieve geolocated tweets, and other social media options can be similarly configured, or can be removed. Here's how to use Public Information for Twitter.

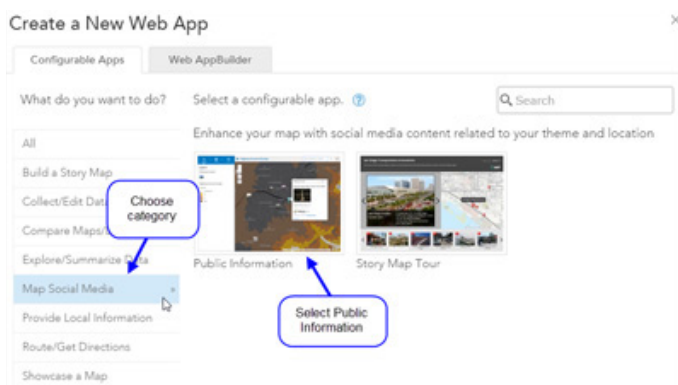
### Configuring the App

**Step 1.** Open an existing map, click Share, then Create A Web App.

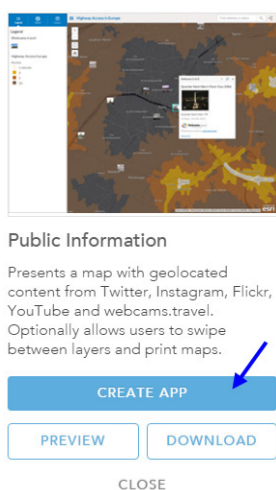
CREATE A WEB APP



**Step 2.** Choose the Map Social Media category in the app gallery, then click to select the Public Information app.



**Step 3.** You can download the app source, preview the app, or create the app. Choose Create App to configure it.



**Step 4.** Enter a title, tags, and a summary description for the app.

Create a New Web App

Specify a title, tags, and a summary for the new web app.

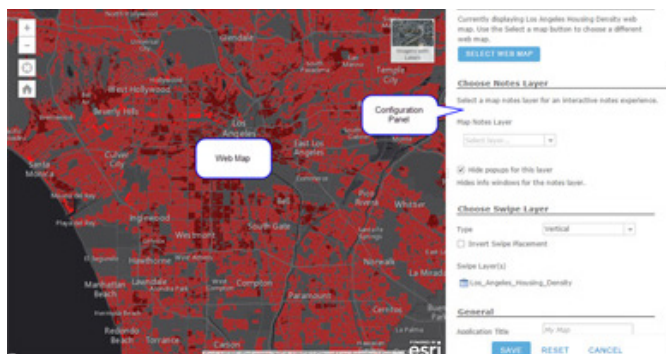
Title: Los Angeles Housing & Homeless Tweets

Tags: Los Angeles X Housing X Homeless X  
Add tag(s)

Summary: Maps tweets matching "homeless" to a map showing housing density in Los Angeles.

Save in folder: berszukaldi

Click Done when finished. The app will display with the configuration panel open on the right.



**Step 5.** Using the configuration panel, configure the application as desired. To display tweets automatically, enable the Twitter layer, make the Twitter layer visible by default, and set the search keyword as desired.

Twitter Options

☒ Enable Twitter Layer  
View Tweets on this map.

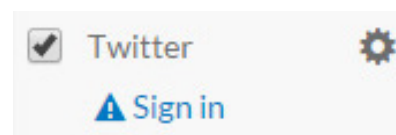
☒ Visible  
Show this layer by default.

Search Keywords: #losangeles

Click Save when finished configuring the app. Note that when testing the app you must login to your Twitter account and authorize ArcGIS access if you've not done this previously.

## Using the app

When the app is deployed, users will see a Sign in prompt:



App users must sign in and authorize ArcGIS.com to connect to their Twitter account to enable tweets to be shown.

Twitter

### Authorize ArcGIS.com to use your account?

Username or email

Password

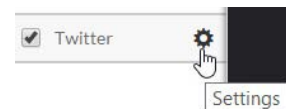
☐ Remember me · [Forgot password?](#)

[Authorize app](#) [Cancel](#)

ArcGIS.com  
www.arcgis.com  
ArcGIS.com

There is an option to Remember me that will save a cookie so logging in won't be required again, unless the cookie is cleared or a new user opens the application.

Once logged in, the user can click settings:



And can change the search if desired.

## Twitter Settings

See what's happening right now.

Search Terms: #losangeles [Search](#)

Tip: use [operators](#) for creating advanced searches.

Twitter Account: [Switch account](#)

The Public Information configurable app provides the easiest way to add tweets to your map. ◆



# Esri's Geotrigger Service: The Future of Geofencing

Esri's Geotrigger Service is a new product that helps developers add real-time location-based messaging and intelligence to iPhone and Android applications.

## What does the Geotrigger Service do?

Mobile applications using the Geotrigger SDKs and API can send targeted location-based messages when users enter or leave geofenced locations the developer specifies. The service can also send information to servers or actions directly to the app, allowing developers to create an immersive experience by dynamically integrating location-based content.

## How can I use location-based messages to empower my users?

If sending the right message at the right time matters to you, then sending it in the right place can ensure that your message is relevant and appreciated. Real-time, location-based messages can be extremely powerful for both marketing and practical applications.

Imagine sending a push notification to one of your customers as they walk into your store, or to one of your city's residents as they get near a road that's been unexpectedly closed. You can also create fun applications like the example below that lets people exploring a city know when they get close to something interesting.

There are many other use cases for the Geotrigger Service, too.

- Notify citizens about road closures, emergencies, or public safety warnings based on their past or current location.
- Inform tourists about interesting places as they explore your city, theme park, etc.
- Engage customers with personalized content or deals the moment they enter a store—or a set amount of time after they have dwelled there.
- Send a message to prospective home buyers when they're near properties that match their search criterion.
- Optimize customer service by notifying employees when a customer who just ordered something from your mobile app arrives at your store to pick up the item.

## What companies and industries are using the Geotrigger Service today?

**AMP Energy and 7-Eleven** - 7-Eleven stores around the United States were geofenced with custom location-based alerts. This innovative marketing program drove distribution and end-cap displays of AMP Energy Orange up 70 percent at participating 7-Eleven stores during the promotion.

**uKnow – Family Safety App** - uKnow, the leading creator of parental intelligence systems, partnered with Esri to create uKnowLocate, a revolutionary suite of family locator services. uKnowLocate uses a geofencing capability powered by the Esri Geotrigger Service, allowing parents to draw a virtual fence around locations of interest such as the home, school, mall or a friend's home. They can then configure customized alerts when their child arrives in or departs from the geo-fenced location.

## How will the Geotrigger Service help me?

**Faster Development** - The Geotrigger Service is here to save you time and frustration. Its consistent interface means faster development of both iOS and Android apps, and its tracking profiles keep you from having to manage the frequency of GPS checks.

**Save battery life** - We know how time consuming it is to manually manage the frequency of GPS checks, and to get the right balance of accuracy and battery life. That's why we baked battery life management into the Geotrigger Service. Just choose one of the three tracking profiles that best fits your app's needs, and you're good to go.

**Built on top of core location services** - The Geotrigger Service greatly enhances iOS and Android's native geofencing features, like the ability to create complex polygon geofences and to notify other servers and services when triggers are fired. There's also a visual editor, allowing you to quickly manage geofence alerts without code. 📍

# Careers

## 1 Business Manager

Experience: 8-12 Years

Qualifications: MBA/MS/BE/MCA

Location: Bangalore

Primary Skills:

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

## 3 Regional Sale Manager

Experience: 14+ Years

Qualifications: MBA/MS/BE/MCA

Location: North

Primary Skills:

- Experience in sales of GIS or related software such as ArcInfo / MapInfo / AutoCAD from assigned geographies.
- Ability to create major opportunities and increase the regional sales revenue.
- Bachelor's degree in Engineering, or related area, and at least 12+ years of experience in the field.
- Speak / Read local Language.

## 2 Business Manager – Sales – BFSI

Experience: 8-12 Years

Qualifications: MBA/MS/BE/MCA

Location: Mumbai

Primary Skills:

- A demonstrated track record of producing high-level sales results in Software Solution area.
- Relevant Self contributor experience along with Partner management experience.
- Solid technical acumen, to understand and translate product's technical requirement

## 4 Senior Database Engineer/ Database Analyst

Experience: 3- 8 Years

Qualifications: Graduate/ Post Graduate

Location: Jaipur

Primary Skills:

- Good knowledge on Administration of Oracle Enterprise server, Administration of ArcGIS Server. ArcFM Server will be an added advantage
- Experience in Publishing and Managing data and data services
- Good knowledge on Spatial data and formats of ESRI
- Awareness on Data security

E-mail your resume to [careers@esriindia.com](mailto:careers@esriindia.com)

Kindly mention the position applied for and your current location in the subject line.

# Esri India Locations



## Ahmedabad

505, Shree Balaji Heights, Beside IDBI Bank, Near Tanishq Showroom, C. G. Road, Ahmedabad-380009, Gujarat  
T: +91-79-40030505  
E: ahmedabad@esriindia.com

## Bengaluru

Ramakrishna Towers, 4th Floor, 31/2, Rupena Agrahara, Begur Hobli, Hosur Road (Near Silk Board Flyover) Bengaluru-560068, Karnataka  
T: +91-80-30289500E: bangalore@esriindia.com

## Chennai

629, Regus Millenia, RMZ Millenia Business Park Level 6, Phase II, Campus 4B, Unit 602A, No.143, Dr. M. G. R Road, Perungudi Chennai-600096, Tamil Nadu  
T: +91-44-66915159  
E: chennai@esriindia.com

## Hyderabad

Q City, Block B, 6th Floor, Sy. Nos. 109, 110, 111/2, Nanakramguda Village, Serilingampally Mandal, R. R. District, Hyderabad-500032, Telangana  
T: +91-40-44486666  
E: hyderabad@esriindia.com

## Kolkata

3B-501, 5th Floor, Eco Space Business Park, Rajarhat, New Town, Kolkata-700156, West Bengal  
T: +91-33-40724446  
E: kolkata@esriindia.com

## Mumbai

4th Floor, Marwah Center, Kishanlal Marwah Marg, Off Saki Vihar Road, Andheri (E), Mumbai-400072, Maharashtra  
T: +91-22-40103200  
E: mumbai@esriindia.com

## Noida

H-7, Sector 63, Noida-201301, Uttar Pradesh  
T: +91-120-4285000E: info@esriindia.com

## Nagpur

4th floor, 186-Indu Yesh II, Cement Road, 407, Near Ramnagar square, Shivaji Nagar, Nagpur-440010, Maharashtra  
T: +91-712-6605869  
E: nagpur@esriindia.com

## Other Branch Offices

Bhopal: +91 7566856786  
Chandigarh: +91 9988996857  
Dehradun: +91 9910498621  
Lucknow: +91 9910498621  
Thiruvananthapuram: +91 9739831851



Esri India Technologies Ltd.

H-7, Sector 63,  
Noida - 201301, Uttar Pradesh (India)  
Tel : + 91 120 4285000 / 5200  
Fax : + 91 120 4285333  
Email : info@esriindia.com  
Web : http://www.esriindia.com