Creating a Real-Time Government with GIS

Industry Perspective











Introduction

Imagine you're hosting an event that has nearly 45,000 participants and 1.7 million spectators along a distance that covers a 234-squaremile city with 2.7 million residents. Also, this event comes after recent mass shootings and terrorist attacks – and it's your job to keep everything running smoothly, safely and efficiently.

This is what the city of Chicago faced in October 2017 while preparing for its wildly popular annual Chicago Marathon. Knowing they'd need more than just the standard data collection and event management approach, Chicago's Office of Emergency Management and Communications (OEMC) opted for a new tactic: real-time geographic information systems (GIS).

In the past, the data that fueled GIS was typically created to represent the state of the geoscape at a specific moment in time historic, current or future. Although this data has proven valuable, the "current" snapshot falls out of sync with the real world quickly. In fact, in today's fast-paced world, "current" is outdated almost as soon as it is created.

To stay up-to-date and prepare for any scenario, Chicago integrated real-time data into its planning and execution. OEMC added runner locations to its shared map by linking to live data from timing mats on the course, which collect data from radio-frequency identification chips each runner wears. Real-Time GIS provided operational awareness as the race progressed. Projecting the location of runners gave all the first responders a common and immediate understanding of the race status.

The goal of a real-time government is to make better data-driven decisions the moment something happens, and the path to that involves ingesting, storing and analyzing real-time data. To better understand how state and local governments can use real-time data to create a smart, responsive community and better serve its citizens, GovLoop partnered with Esri, a leader in GIS technology, for this report.

In the following pages, we'll help you understand what real-time GIS is and why it is so impactful, the steps and tools that can help you achieve the true benefits of real-time data, and how government agencies that use it are becoming governments of the future.

Defining Real-Time Government and Its Benefits

So, what is real-time GIS, what does it look like and how can it help state and local governments?

First, it's important to understand that the data that fueled GIS and governments in the past was typically created to represent the state of something at a specific moment in time. That could have been data that was collected to tell what had happened in the past, or data, maps and analyses created to depict the current state of a community or forecast the future state based on trends and patterns.

What state and local agencies are finding today is that current snapshots of data become outdated very quickly. So how can a government truly become "real-time smart" and serve its citizens with the best decisions possible if it's working with obsolete data? It can't. That's why real-time GIS is so critical for smart communities. Simply put, smart communities are about connecting people to technology to achieve better outcomes. Essentially, real-time GIS is a continuous stream of events flowing from sensor data feeds and devices. When transmitted, stored, ingested and analyzed, this data helps accelerate location-based awareness and decision-making.

Real-time GIS lets government simultaneously tap into, analyze and display streaming data from many sensors, devices and social media feeds. Agencies can define filters and location-based analytics that automatically refine and focus real-time data on events that matter most to internal users and the citizens they serve.

Real-time GIS provides other critical benefits:

Improve Situational Awareness During Events: When disasters strike, every second counts. Realtime situational awareness saves lives and helps protect people, property and critical resources. That's why police, fire and emergency management organizations at all levels of government use real-time GIS capabilities in their operations and dispatching contors.

Track Tens of Thousands of Assets in Motion:

Getting the location of a moving object is one thing, but tracking entire fleets of vehicles, vessels or aircraft in real time allows moment-bymoment decision-making for improved operational awareness. Ports, airports, transportation companies and governments can all benefit from Real-Time GIS technology to monitor moving assets.

Monitor an Unlimited Number of Stationary

Sensors: Delivering products at optimal freshness or guaranteeing the most reliable service can be critical for governments. Those that need to store and transport perishables or deliver safe energy to consumers can use Real-Time GIS to monitor data feeds from distributed sensors for better citizen service.

Open Your Gateway to the Internet of Things:

Making sense of big data produced by the Internet of Things (IoT) can be challenging for government. But what if that huge volume, relentless velocity and staggering variability of data flowing into agency systems could be filtered, analyzed in real-time and then stored for future big data analysis? A Real-Time GIS platform can leverage reliable cloud services – such as Microsoft Azure – so that governments can scale big when they need to.



How to Move Toward a Real-Time Approach to Government

A connected government participates in the creation and maintenance of data and real-time information. They move away from creating siloed smart projects and set up a true real-time infrastructure that can ingest, collect and analyze real-time data.

Luckily, modern technology provides today's agencies with the opportunity to transform their organizations. The availability of real-time data can help them respond to incidents sooner and excel in the face of chaos.

However, consuming this massive influx of data without a system to capture, analyze and process it into actionable information will leave agencies buried under a pile of raw content. Esri's GIS technology uses location data and provides the tools that enable you to instantly see what is happening, identify where it is happening, understand why it is happening and share all that information with those who need it.



5 Steps to Take

- **Build key maps:** Your operations are based on locations. Having access to relevant organizational maps provides location-based reference points. GIS should act as the system of record for all the location data in your organization.
- 2 Connect IoT data: Real-time data, such as that coming from IoT sensors and devices, is streaming into your organization. Connecting the appropriate mission-based data to your mapping platform helps filter out noise and enables you to understand situations quickly and focus on what's happening in critical areas.
- Analyze data in real-time: GIS is the ideal tool to visualize, analyze and make sense of IoT data. Location analysis can identify hot spots of activity and relay them back to your organization's resources. Quickly determine where events are developing or threatening citizens or employees so that you can rapidly respond.
- Share information: Decision-making occurs across your organization. Make sure that decisions are based on timely, reliable and up-to-date sources of information. GIS, with streaming real-time data, enables you to communicate that information to decisionmakers freely, easily and automatically.
- Organize and decide: With the appropriate analysis of data and access to information, everyone in your organization is equipped with the support they need to make accurate decisions and respond to fluid conditions. You can more effectively protect life and property, execute your missions, and reduce confusion during critical operations.

The Right Tools

Esri provides a suite of tools that can help government get started on their path toward using real-time data and GIS to become a smart community.

- ArcGIS GeoEvent Server: ArcGIS GeoEvent Server can track dynamic assets that are constantly changing locations, such as vehicles, aircraft and vessels, or stationary assets, such as weather and environmental monitoring sensors. In addition, it provides real-time situational awareness for coordinated field activities. It allows you to monitor your most valuable assets on a map in real-time for better decision-making on-the-fly.
- Insights for ArcGIS: Insights for ArcGIS is a web-based, data analytics workbench where you can explore spatial and nonspatial data, answer questions you didn't know to ask, and quickly deliver powerful results. You can integrate and analyze spatial and tabular data for contextual analysis from your enterprise databases, ArcGIS data, geodatabases, Microsoft Excel spreadsheets and ArcGIS demographic data.
- Operations Dashboard for ArcGIS: Operations Dashboard for ArcGIS is a configurable web app that provides location-aware data visualization and analytics for a real-time operational view of people, services, assets and events. From a dynamic dashboard, view the activities and key performance indicators most vital to meeting your organization's objectives.

The Right Cloud Platform

Esri's Real-Time GIS solutions can run on-premises, in the cloud or a hybrid cloud, or as an Esri Managed Cloud Service. Esri partners with Microsoft to enable government agencies to deploy Real-Time GIS on Microsoft Azure Government. Azure Government is the only government exclusive cloud with a dedicated physical datacenter network nationwide, designed for use by US federal, state and local agencies and their partners. Azure Government provides the public sector with a trusted cloud technology with the most certifications and attestations of any cloud provider, and meets critical government compliance requirements. With ArcGIS and Azure Government, users can establish bi-directional communication with billions of Internet of Things (IoT) devices via the Azure IoT Hub. Together, Esri ArcGIS and Microsoft Azure Government, provide the distributed processing power, security, and scalability to monitor, analyze, and share Real-Time GIS information across your organization.



ArcGIS GeoEvent Server

Tips for Using Real-Time Data

- Ingest high-velocity, real-time data into ArcGIS.
- Perform continuous analytics on event data as it comes in.
- Store observations in a spatiotemporal big data store.
- Visualize high-velocity and -volume data as an aggregation and as discrete features.
- Notify those who need to know about patterns of interest in real-time.



Case Studies

Cal OES GIS

Cal OES: GIS Collaboration in Emergency Management

When a disaster strikes, knowing what you need and how to find it can be the key factor that saves lives, resources, and critical infrastructure. Nobody knows this better than the California Governor's Office of Emergency Services (Cal OES), which is responsible for all disasters that happen in the state that exceed local residents' and departments' ability to respond to them. In a state where earthquakes, floods and wildfires are common, this can be an overwhelming task.

Dan Bout, Assistant Director of Response at Cal OES, says this is why they turned to GIS and Esri services. "Far and away the biggest challenge we have... is synthesizing data in an incident," he said. "As you get more and more data feeds, the potential for miscommunication becomes a salient issue." This became clear in August 2014, when the 6.0 magnitude South Napa Earthquake rocked the City of Napa, California, crumbling historic brick buildings, damaging houses, and causing widespread water leaks. Napa needed to make information in the city's GIS available to city staff and other agencies to help coordinate response and recovery efforts as well as keep the public and media informed. To make that happen as rapidly as possible, they reached out to the Esri Disaster Response Program (DRP) for assistance. DRP is available whenever and wherever disasters occur to provide expert assistance, remote support, software, data, and information products as part of Esri's corporate citizenship. When a major disaster occurs, DRP immediately begins generating data layers and information products that can support agencies responding to that event.

Immediately after the earthquake, Cal OES created situational awareness maps using its traditional workflows to produce paper maps for daily State Operations Center (SOC) and executive briefings using ArcGIS. These maps incorporated data gleaned from the agency's Situation Status Report. The City of Napa and Cal OES demonstrated that Esri's ArcGIS Online can be a powerful tool for emergency response.

Iowa DOT: A Better Snowplow Inventory with GIS

The Iowa Department of Transportation (DOT) deploys about 900 snowplows each winter to plow 9,479 centerline miles of road and 25, 215 lane miles of roadway.

The Iowa DOT turned to Esri and their GIS technology to improve its response to winter storm challenges and keep the public informed. Iowa DOT introduced an application built on Web AppBuilder for ArcGIS that visualizes the costs of keeping state-owned roads clear during winter weather. The resulting website, trackaplow.iowadot.gov, provides a way for anyone with Internet access to see where Iowa DOT's snowplows are operating, to find out what materials they are using, and to view images from cameras fixed to the windshields

These GIS efforts help combine the DOT's snowplow tracking efforts into an easily-accessible map to show garage supervisors real-time road conditions and help them manage their resources. Their GIS story maps also provide real-time information on road conditions to assist the public in making safe, informed travel choices when weather is bad, and they help control cost while eliminating the need for laborious record keeping.

"Our snowplow trucks are now equipped to collect a wealth of information. Some of it is more useful to managers and supervisors at the DOT and some of it helps everyone," said Eric Abrams, Geospatial Administrator, Iowa Department of Transportation. "We've made the data available in a variety of layers on the track a plow site so people can pick and choose what they want to see. So far, the camera layer has been the most popular with the public."

In addition to the snowplow effort, the Iowa Department of Transportation started using GIS to create a better road inventory system, and has expanded to a Web GIS system using ArcGIS Online for the entire department. Implementation of the ArcGIS platform has saved the department time and money in countless other projects.

"GIS has transformed the way the Iowa DOT does business," said Abrams.





Port of Long Beach: Implementing GIS-Based Security

Occupying more than 3,200 acres of land with 25 miles of waterfront, the Port of Long Beach poses a major challenge for security operations, particularly since it is an open port that provides docking services to pleasure and small business craft and commercial cargo ships. In addition, more than 15,000 trucks and 100 trains move in and out of the port every day. The dynamic nature of the port, with its constant movement and 24-hour operations, requires close surveillance.

Like many ports, Long Beach maintains a multilayered physical security system that includes closed-circuit television surveillance, helicopter downlinks, radar tracking, and sonar and other sensor-based systems. About six years ago, Esri's ArcGIS was added to help visualize security operations, and the advantages of making GIS central to the port's joint command and control center were quickly realized. "Virtual Port is a dynamic, ArcGIS [software]based system that is fundamental to our security operations," said Randy Parsons, Director of Security for the Port of Long Beach. "It is the essential technology of our command center and has allowed us to geospatially enable our entire security operation. So we now have more than 60 geographically referenced databases that are integrated with the existing elements of our physical security system, which increases exponentially our ability to monitor and analyze our daily operations."

Additionally, Virtual Port is used for two other primary functions: incident response and business recovery.

"While Virtual Port provides us with a clear operational picture of our extensive day-to-day security activities, we have found that it is also helping lower our business operating costs by streamlining those processes," concluded Parsons. "This is a huge benefit to centralizing our security operations around ArcGIS because it provides us with an increasing return on investment."

Conclusion

In today's hyper-paced, data-rich world, information that gives you a snapshot of what's currently happening is no longer enough. State and local governments that hope to support smart communities must turn to real-time information from streaming sources and sensors in the field to make the best decisions and choices. By adopting Real-Time GIS to monitor and analyze data, governments will gain the power to know what is happening as it happens, react and make smarter decisions faster, and get alerts when events of interest occur.

About Microsoft

Microsoft (Nasdaq "MSFT" @microsoft) is the leading platform and productivity company for the mobile-first, cloud-first world, and its mission is to empower every person and every organization on the planet to achieve more.

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About GovLoop

GovLoop's mission is to inspire public sector professionals by serving as the knowledge network for government. GovLoop connects more than 250,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to the public sector.

For more information about this report, please reach out to <u>info@govloop.com</u>.



About Esri

When Esri was founded in 1969, we realized even then that geographic information system (GIS) technology could make a difference in society. Working with others who shared this passion, we were encouraged by the vast possibilities of GIS. Today our confidence in GIS is built on the belief that geography matters - it connects our many cultures and societies and influences our way of life. GIS leverage geographic insight to ensure better communication and collaboration.

Explore our website to discover how our customers have obtained the geographic advantage by using Esri software to address social, economic, business, and environmental concerns at local, regional, national, and global scales. We hope you will be inspired to join the Esri community in using GIS to create a better world.

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