Delivering Transit Asset and Planning Information in Chicago

By Matt DeMeritt, Esri writer

The Chicago Regional Transportation Authority (RTA) oversees three transit agencies within northeastern Illinois. Together, those agencies provide nearly two million rides per day, making it the third-largest public transportation system in North America. To improve its service to the public and RTA's stakeholders, planning staff at RTA recently created an improved map-based information delivery system that provides internal and public access to transit-based data.

As the planning and financial oversight agency for Chicago Transit Authority, Metra, and Pace Suburban Bus, the RTA warehouses planning and financial information regarding northeastern Illinois' transit system. This warehouse is called the Regional Transportation Authority Mapping and Statistics (RTAMS) website. The RTA uses ArcGIS for Server combined with ArcGIS Viewer for Flex for mapping and performing geospatial analysis on various tabular datasets and sharing web-based mapping applications to the public and affiliated agencies that need transit information.

Transit Information Delivery System

Since the RTA has no dedicated full-time GIS staff, the responsibility to deliver a geospatial information-sharing system fell to staff planners Brad Thompson and Hersh Singh. Both Thompson and Singh are experienced in GIS; however, they have very little programming experience. In 2010, Thompson attended the Esri International User Conference to investigate software resources that would allow non-GIS experienced staff to view, analyze, and edit datasets that can be linked to existing GIS layers.

After seeing a demo of ArcGIS Viewer for Flex [where an Esri staff member created an interactive map in minutes], I knew that was the solution for creating a variety of mapping applications and eliminating the paper map production process," says Thompson. "The customizable appearance of Flex and the ability to easily add widgets inspired us to dive deep into it." Within months, Thompson and Singh had created multiple browser-based applications serving internal transit staff and the public.

RTA's web-based applications range from maps for identifying RTA-managed transit-oriented development studies to maps that display demographic data indicating an area's potential to generate local transit trips based on transit trip rates. By serving this geospatial information on the web, users are able to interact with the data, allowing user-defined scaling, queries, and other functionality that would not be possible with static paper maps at fixed scales.

Paper to Digital

RTA staff has traditionally received requests for demographic information. Each of those requests usually entails several procedures, including the creation of a hard-copy map.
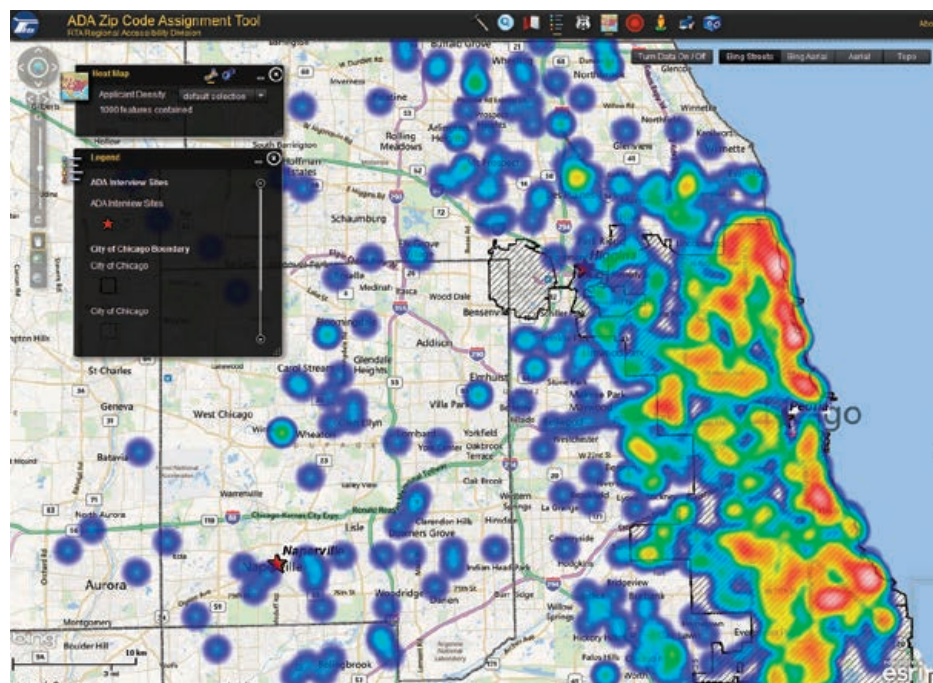
↑ RTA staff uses the ADA Zip Code Assignment Tool to identify potential new facility locations based on user origin densities.

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Summer 2013

Manager's Corner

Terry Bills
Esri Industry Manager
Transportation and
Logistics

This edition of *Esri News for Transportation* highlights the rapidly growing use of 3D GIS for a wide range of applications. With the Geodesign Summit still fresh in our minds, it is gratifying to see that planners and transportation professionals are discovering a myriad of ways in which 3D applications can assist them. Whether determining safe flight paths for the next generation of air traffic control or finding the optimal alignment for public transport and effectively communicating that vision to the public, it is clear that we are increasingly moving to a three-dimensional world.

The next step in this progression will be the construction of realistic 3D models of our facilities, which will be integrated with our standard business systems, such as facility and maintenance management, and, when combined with lease and security management, provide a rich platform for managing our complex facilities. Supporting this trend represents a major focus of our own research and development efforts here at Esri.

Two articles in this issue highlight another strong trend in transportation: the increasing number of transportation agencies that have come to recognize the advantages of understanding ArcGIS as a platform, which allows them to support a wide range of business functions across their organizations. The Roads and Transport Authority in Dubai has always been a leader in its part of the world, having designed one of the most impressive metro systems anywhere. Today, it is moving to a comprehensive system based on Esri technology, designed to help better manage disparate facilities and operations.

The same is taking place at Virginia Department of Transportation, where ArcGIS helps support most of the lines of business, from safety to asset management. The Esri Roads and Highways solution has been designed to help highway-oriented agencies manage the often multiple linear referencing methods used to capture and store linear asset information, all with the goal of providing the underlying platform to help users better manage the resources under their control and make more effective decisions.

ArcGIS for Aviation Improves Data Management and Chart Production

Esri Solution Enhances the Power of Spatial Data for the Aeronautical Community

Esri has released ArcGIS for Aviation, a new solution to support users in the aeronautical information management, air navigation service provider, and airport markets. This solution enables users to create, manage, review, and share aviation data. ArcGIS for Aviation includes ArcGIS for Aviation: Charting and ArcGIS for Aviation: Airports. Together, these products provide a comprehensive geospatial platform for aeronautical chart production and airport operations data management.

ArcGIS for Aviation: Charting (previously Esri Aeronautical Solution) improves, standardizes, and increases data and workflow management by allowing standards-based aeronautical data to be captured, maintained, and managed in a centralized database. With it, users can produce standardized and customized electronic and paper aeronautical charts. ArcGIS for Aviation: Charting provides the ability to do the following:

- Significantly reduce chart production times via automated batch cartographic processing
- Share data within the aeronautical community using the Aeronautical Information Exchange Model (AIXM) standard
- Enhance data quality through direct loading of digital changes and automating change verification

ArcGIS for Aviation: Airports assists airports and their consultants in complying with data management and quality standards such as the Federal Aviation Administration's (FAA) Airport Surveying—GIS program. It provides tools, templates, and analysis functionality that introduce efficiencies and new capabilities into the planning, maintenance, and day-to-day operations of airports.

"GIS is used across all sectors of aviation, but each sector has unique requirements," says Bruce Frank, Esri's ArcGIS for Aviation program manager. "ArcGIS for Aviation provides our aeronautical information management and airport customers with an optimized solution for their unique business needs."

For more information on the ArcGIS for Aviation platform, contact aero@esri.com or visit esri.com/arcgisforaviation.

Delivering Transit Asset and Planning Information in Chicago

"Requests for mapping each senate district, or for maps of every house district, literally required at least a month of solid work," says Thompson. Instead of trying to access separate hard-copy maps of Chicago's dozens of wards and districts, visitors can now go to an online map where they can interactively select a dataset, transit service, or jurisdiction and view it. "Now, we'll get a request in the morning, and I can publish one .mxd file by the afternoon," says Thompson. "Visitors can run their own type of spatial analysis—and they don't ever have to know what a shapefile is or how to open an attribute table, any of that."

RTA uses ArcGIS Viewer for Flex to easily add and customize content and tools. The default configuration includes tools and preconfigured templates that allow developers to serve geospatial content in a multifunctional website. Developers can easily extend the capabilities of the application by customizing the included default widgets or using freely available widgets created by the Esri community. Such widgets and tools include heat maps for creating raster-based density layers based on selected datasets; routing with directions and travel times; and querying, editing, and export tools for saving maps as .jpg files.

Internal Applications

Since installing ArcGIS for Server software and incorporating ArcGIS Viewer for Flex, the RTA has deployed numerous mapping applications that assist staff within the organization with managing RTA programs, such as Americans with Disabilities Act (ADA) certification. One of the RTA's mapping applications includes the Interview Site Assignment tool, used for assigning ADA paratransit applicants within a ZIP code to the nearest ADA interview site where they can be interviewed and their functional ability to take fixed-route transit services can be assessed. With the recently added editing widget, staff can also use the application to reassign ZIP codes to different interview sites based on applicant wait times for an interview appointment. Thus, the wait times at each of five interview sites are monitored, and when it's appropriate, ZIP codes can then be reassigned to other sites to equalize wait times among all the sites. "The original requester wanted an update to his hard-copy map to aggregate ADA riders and potential riders by ZIP code," says Thompson. "Within less time than it would have taken to create a hard-copy map, we were able to create a URL with much more functionality than he ever expected he'd get."

Another internal application, the Transit Benefits Viewer, is used by RTA staff to
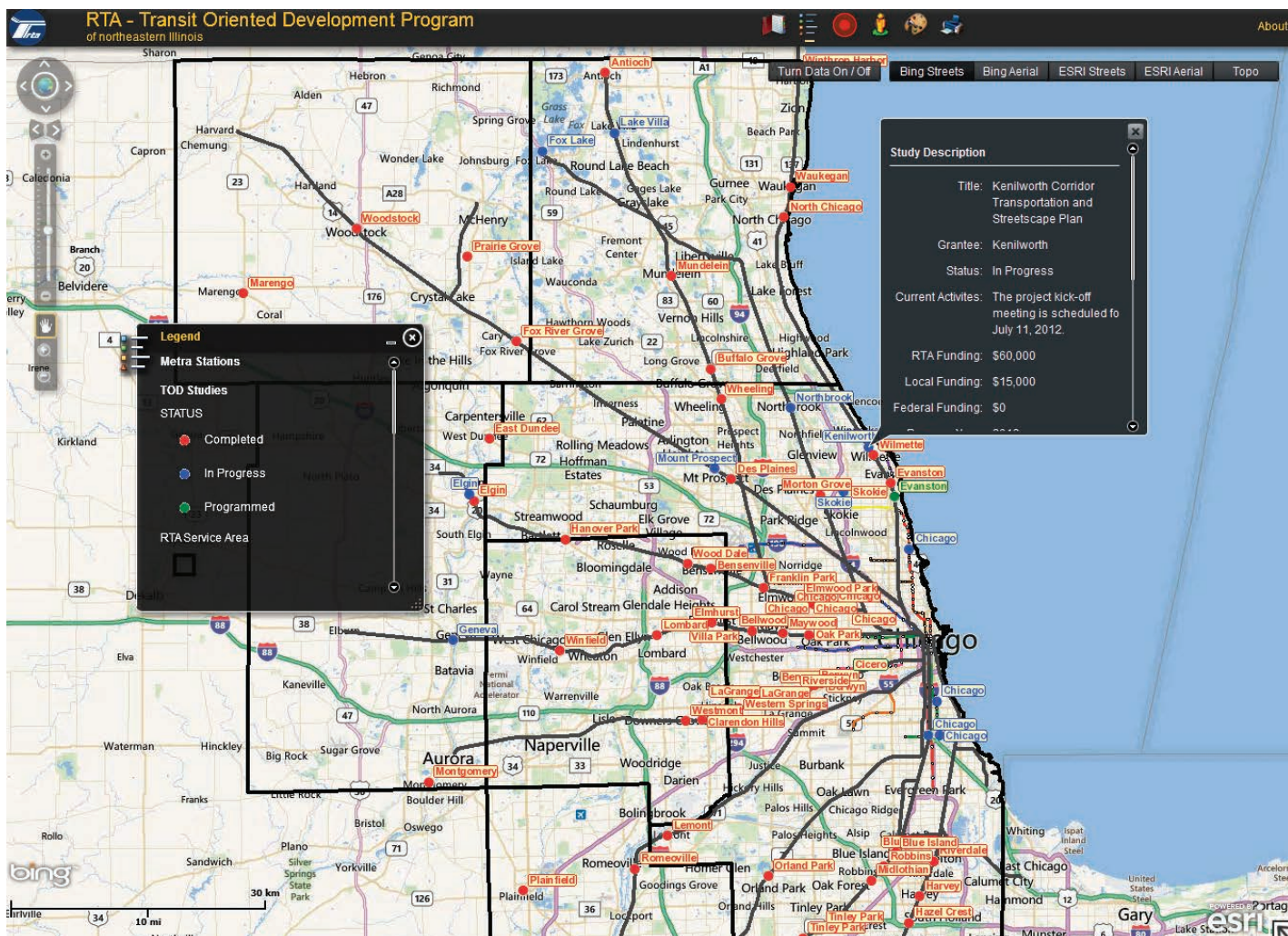
↑ RTA staff uses this ZIP code-based map to manage current paratransit riders and assign potential paratransit riders to training facilities.
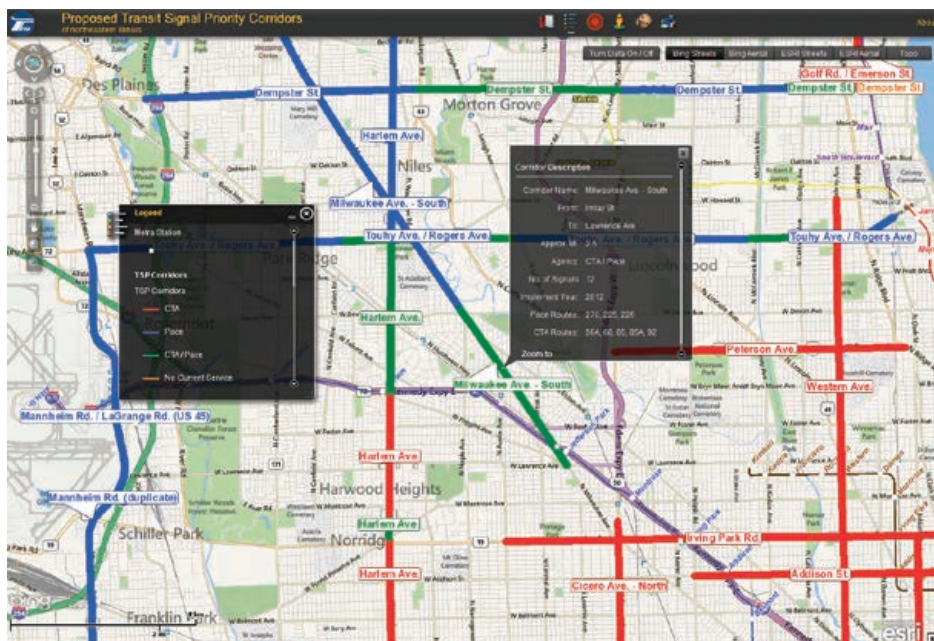
↑ This map allows users to identify and view associated information on proposed transit signal priority corridors in northeastern Illinois.

manage and support the marketing efforts of the RTA's Transit Benefits program. This program helps employees and employers save money by taking advantage of an IRS allowance that permits participants to pay for transit via pretax salary deductions.

The RTA also provides numerous external applications. One example is the RTA Regional Transit Index, an application for displaying a combination of demographics that are indicators of an area's potential to generate local transit trips, based on transit trip rates in the Chicago region. Another example is the transit signal priority (TSP) application that displays corridor locations rendered by service provider.

ArcGIS for Server has enabled RTA to serve many different geospatial datasets internally and externally and create an enterprise data warehouse for the agency. By integrating GIS web technology into the organization, sophisticated map site development and geospatial analysis are now within reach of the public and staff with no GIS experience.

3D Airport Air Space Analysis for Compliance and Permitting

By Khalid Siddiqi, Ricondo & Associates, Inc.

Airports today are increasingly looking for ways to maximize nonaeronautical revenues to help sustain, rehabilitate, and—in some cases—expand their facilities and infrastructure. While it is important to take advantage of the economic growth opportunities that an airport brings to a community, a balanced approach between land use and safety of navigation needs to be considered. GIS analysis and visualization help ensure that structures and natural features, whether existing or proposed, do not impede upon an airport's air space.

Air space surrounding an airport is generally controlled by complex "imaginary" three-dimensional (3D) surfaces designed to protect aircraft during approaches to and departures from airports, in accordance with Federal Aviation Administration (FAA) requirements. Air space surfaces are established in relation to the airport and to each runway. The dimensions of the air space surfaces are based on the type and precision of the approach, departure climb gradient, and either existing or planned published approach and departure procedures.

Generally, there are four perspectives in air space analyses:

- FAA regulations governed by the types of approach and departure procedures
- Airline departure surfaces to protect operations in the event of engine failure of multiengine aircraft (commonly referred to as one-engine inoperable)
- Future development within the airport
- Off-airport development within the surrounding communities

In support of these requirements, the Metropolitan Washington Airports Authority (MWAA) asked Ricondo & Associates, Inc. (R&A), to prepare an air space analysis for Ronald Reagan Washington National Airport. MWAA's objectives were to clearly understand the off-airport development constraints necessary to protect air space surrounding the airport and to have the ability to easily communicate those constraints to senior management, local zoning boards, city planners, and real estate developers to assist in decision making.
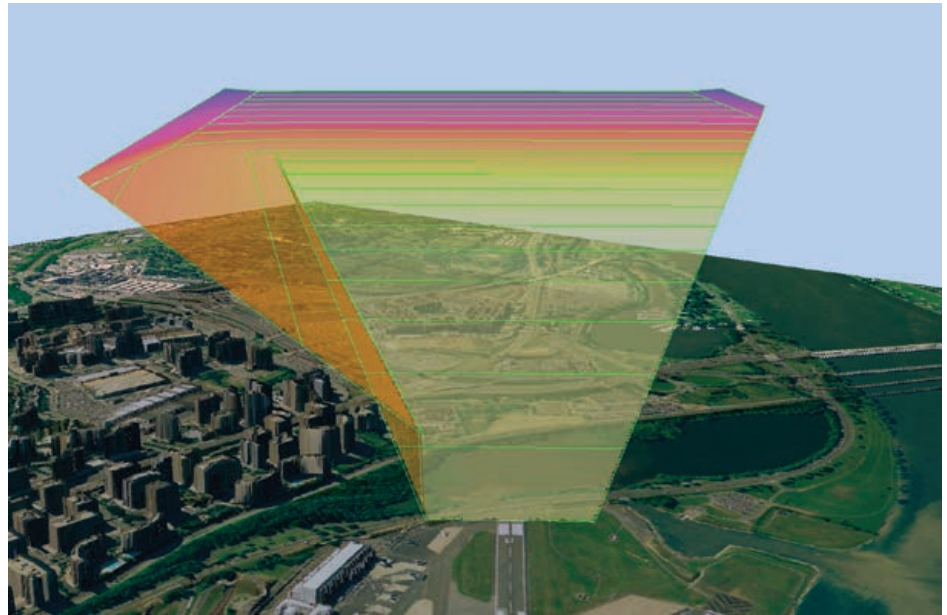
↑ 3D model of airspace surface depicted in relation to 3D buildings, generated in ArcGIS 3D Analyst.

Using ArcGIS 3D Analyst, R&A developed 3D models of air space surfaces, terrain, and buildings. Once the models were developed, the use of 3D Analyst made it easy to identify each air space surface and to determine from those surfaces the maximum allowable heights of objects surrounding the airport. This is all the more important since Reagan National is adjacent to the high-rises of Crystal City, Virginia, and the approach zone for runway 15 is positioned over the Pentagon.

R&A provided the air space analysis results, including all the air space surfaces, in 3D GIS format as well as in a 2D hard-copy reference booklet with 3D images of the surfaces. The GIS files will enable technical users to conduct precise and detailed locational analyses of potential air space issues. Most importantly, the reference booklet will enable MWAA staff and nontechnical users to review the surface areas efficiently without the help of technical users. The reference booklet is geared to upper-management staff, who typically require basic overviews and not necessarily detailed analyses to answer questions.

The 3D images that were developed in ArcGIS provide users with an exact depiction of what the air space surface would look like in the real world. This perspective is critical in displaying 3D models of air space surfaces in relation to 3D buildings. The images enabled MWAA to clearly visualize the air space surfaces and the surrounding areas.

Ricondo & Associates

Ricondo & Associates, Inc., is a full-service aviation consulting firm specializing in airport consulting in support of airport owners and operators, airlines, and federal and state agencies. R&A provides technical airport consulting and project management services related to facilities planning, operations research, environmental planning, business management, and financial planning. Khalid Siddiqi is R&A's senior GIS airport planner with 15 years of aviation-related experience.

Virginia Department of Transportation Stays on Track with Esri Enterprise Advantage Program

By Matt DeMeritt, Esri writer

Virginia Department of Transportation (VDOT) builds, operates, and maintains the nation's third-largest highway system, which serves Virginia's eight million residents and out-of-state travelers. The agency's use of transportation network data to support informed decision making began to require increased functionality and greater availability as the agency's technology needs and information requirements grew. Enhancing the VDOT Information Technology Division's GIS program involved a comprehensive review and upgrade to advanced GIS tools and services that came from consultation with Esri software experts, industry advisers, and staff instructors.

The Enterprise Advantage

Facing decreasing resources and limited access to hardware, VDOT began the improvement of its enterprise GIS with internal resources. While implementing advances on its own, the department soon realized the project wouldn't meet the time table established for completion. After investigating and becoming more familiar with the Esri Enterprise Advantage Program (EEAP), VDOT management subscribed to EEAP. The EEAP is a technical advisory, consulting, training, and support solution offered by Esri to meet the diverse needs of Esri's enterprise customers. Because it involved the in-person support of Esri software experts and instructors, it was the ideal solution to help VDOT complete the upgrade of its enterprise GIS and begin delivering the increased functionality and adoption of GIS technology the agency needed. The EEAP provided VDOT with the services to develop a three-year, high-level work plan outlining consulting activities, technical advising, and premium support recommended to meet the GIS program goals.

Refined Process Workflow

With the support offered through the EEAP, VDOT was able to review its strategic goals and develop a tactical plan that aligned with VDOT's primary objective to strengthen its GIS framework to better support business units and critical spatial processes, such as VDOT's linear referencing system (LRS). VDOT's Roadway Network System (RNS) maintains Virginia's LRS and core highway inventory data. RNS location references business data on the LRS and provides the data in a tabular, linear, and geographic context for use by traffic engineering, highway maintenance, transportation planning, and local assistance professionals. VDOT has invested a significant level of effort to build RNS, which is composed of a complex relational data model, database-centric logic based on stored procedures, a web interface for data querying and editing, and geoprocessing scripts that produce the geospatial data products. Esri helped the GIS and RNS technical teams improve the agency's LRS through an intensive review by Esri's transportation and technology experts that led to process recommendations based on industry best practices regarding the development of a common data model and data management strategy to share road centerline data between state agencies and local governments.

The EEAP provided the GIS program with the support and expertise to engage various agency divisions on augmenting their use of current geospatial technology for specific business needs. One of the methods VDOT has utilized the EEAP for has been to design and construct business-driven prototype applications. Initial prototypes include a web-based application to conduct spatial analysis of traffic engineering safety data, a mobile solution to inventory and inspect roadside maintenance infrastructure, and a set of tools for Virginia's transportation planning community to evaluate and propose alternatives to future potential road-building activities. Through this work, the GIS program has been able to more effectively leverage the agency's investment in Esri's enterprise license agreement. In addition, the GIS and RNS technical teams have been able to take advantage of Esri Premium Support Services, thereby reducing GIS program and other IT staff time to resolve more complex issues.

Return on Investment

By subscribing to the EEAP, VDOT has been able to reduce costs by decreasing duplication of data, streamlining technical procedures to lower data processing times, and easing time devoted to GIS administration tasks. Esri's EEAP team technical adviser acted as an advocate on the GIS program's behalf with internal business units, providing advice on industry standards and best practices, ensuring a quick response to critical path issues, and providing a forum for collaboration and sharing with other DOTs. The Esri team that has supported and been crucial to VDOT in making this program successful consists of the practice manager, account manager, EEAP technical adviser, and Premium Support technical account manager. The agency has received rapid, essential support at every level of the organization as needed. VDOT has renewed the program subscription for an additional three-year term.

For information on the Esri Enterprise Advantage Program, visit esri.com/eeap.

Balancing Past and Future

Using 3D GIS Analysis to Route Light Rail through Historic Mesa

By Cory Whittaker, City of Mesa, Arizona

In December 2008, the Valley Metro Light Rail system debuted in the Phoenix metropolitan area. *[Valley Metro Rail Inc., a nonprofit public corporation, operates a high-capacity transit system in this region.]* In the months that followed, the City of Mesa's single station had more passengers than any other stop on the system.

When this trend continued, Valley Metro decided to expand the light rail system through downtown Mesa. This announcement was seen as a victory for revitalization efforts in the city. Neighboring cities have seen that light rail is a catalyst for transit-oriented

↑ The 3D Model of Downtown Mesa

↑ Valley Metro Light Rail's Sycamore Station in Mesa has had the highest ridership of any station in the light rail system.

development of nearby properties.

The proposed route takes the light rail line through the heart of downtown Mesa to cultural venues such as the Mesa Arts Center and the Arizona Museum of Natural History. The route also passes through the historical center of Mesa, where buildings and places of historic significance—some listed on the National Register of Historic Places—are located.

To better understand how this project would interact with the nearby historic buildings, 3D GIS visualization tools were used. These tools gave decision makers and the public a virtual view of what downtown Mesa might look like after the light rail system was completed.

Modeling Downtown Mesa

Before the light rail expansion was proposed, City of Mesa GIS staff conducted a pilot project to assess the feasibility of modeling downtown Mesa in 3D given existing departmental resources. This happened just as the economy began to nose-dive and budgets were shrinking. Staff used readily available software to render Mesa City Plaza in 3D with minimal effort and cost, demonstrating to city management not only that modeling buildings in 3D was feasible but that staff members had the necessary skills. The results could be easily imported into the City of Mesa's existing Esri-based GIS.

This successful pilot project provided the impetus to begin creating a 3D model of downtown Mesa. The first step in creating

the virtual downtown was inventorying and estimating the heights of all non-single-family buildings. This inventory established a starting point for constructing virtual buildings.

Data for the inventory was collected in two ways. For some site locations, original, detailed building plans were readily available, and these were used to create individual building structures that were accurate down to the inch. For buildings that predated the city's founding, no plans were available, so oblique aerial photos were used to digitize these buildings. Although these buildings were not as accurate as ones created using detailed plans, they were sufficiently accurate for purposes of analysis. Much time and effort were expended to capture each building in enough detail that it could be immediately recognized without a label.

Working with the Community

The city needed to establish policies for development along the light rail route. Upon completion and approval, these policies would be organized into a document called the Central Main Plan. A committee composed of city planners and local property owners, business owners, and organizations

↑ This 3D rendering shows the proposed development intensity for residential (yellow), commercial (red), and mixed use (purple). The number of stories and lot coverage for each is shown.

↑ The Historic Alhambra Hotel Shown with the Adjacent Proposed Redevelopment

such as historic neighborhoods and business alliances was formed to gather different viewpoints from the community. The committee helped the city maximize the benefits of the light rail expansion.

The committee performed one key exercise, called the Reality Check, using the 3D GIS visualization tools to answer four important questions about the future development along the light rail route:

• Where should development/redevelopment occur?
• What areas are off limits to redevelopment?
• What will be the intensity of the development/redevelopment that is envisioned?
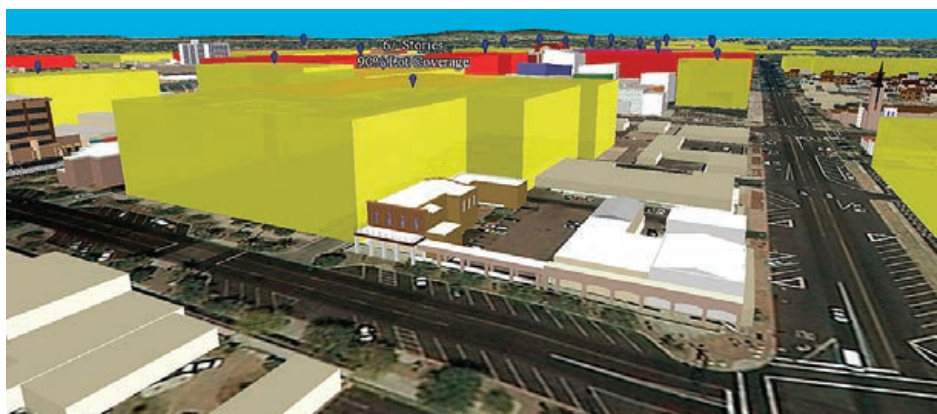• Is this achievable?

With these questions in mind, committee members were asked to map where they would put 4,000 dwelling units and 1.8 million square feet of nonresidential floor space. Committee members could incorporate their grand ideas for downtown Mesa. After compiling the results, city planners had a blueprint of where and how much redevelopment would be possible. Parking lots, a few existing buildings, and vacant lots were identified as potential redevelopment sites.

With the redevelopment areas, number of dwelling units, and the amount of nonresidential square footage defined for each area, city management requested a 3D GIS analysis for these areas. Calculations based on the number of dwelling units, square footage, land use, and lot coverages showed how tall buildings would need to be to fulfill the proposed requirements. Buildings at these heights were displayed in 3D next to existing building footprints. The three light rail stations and rail tracks associated with them were also modeled in 3D. This analysis explained complex development planning criteria to Mesa citizens in an easily digestible format that helped them envision redevelopment potential along the light rail path.

At first glance, it was clear that the redevelopment areas had something in common. The majority of the buildings along the light rail route in downtown Mesa front along the street with large parking lots behind them. Because most of the proposed redevelopment is slated for these parking lots, they are a blank canvas for downtown revitalization efforts.

Seeing Today and Tomorrow

Preserving the historic character of downtown Mesa was a key priority. The Alhambra Hotel was built in 1893 and is located in the heart of downtown Mesa. Although it was partially destroyed by fire, the building was added to the National Register of Historic Places in 1993. No longer a hotel, it still has historic value and is located just south of the light rail route, next to a large parking lot that is the site of a proposed six-story building with 90 percent lot coverage. The proposed building, nearly three times taller, would dwarf the Alhambra and possibly harm its historic value.

Without a 3D GIS view, the magnitude of the disparity in the heights of these buildings would be lost. With this visualization, it was clear that caution would need to be exercised when redeveloping this site to ensure that the historic character of the Alhambra Hotel is preserved.

Light rail expansion through downtown Mesa spawned a significant 3D GIS effort that also provides potential benefits in other areas of the city. With this information in GIS, the city can conduct viewshed and line-of-sight analyses. City of Mesa Police and Fire departments want to use the 3D model in strategic planning for special events in downtown Mesa. The 3D model of downtown provides the flexibility and opportunity to model building interiors for asset management, real estate requirements, and similar purposes.

Being able to see how downtown Mesa would look with the completed light rail system and subsequent redevelopment helped the public see the benefits of having this mode of mass transit in the city of Mesa. This project has also opened the minds of city leaders and citizens to the benefits of 3D GIS analysis for standard city operations.

About the Author

Cory Whittaker, GISP, is a GIS specialist for the City of Mesa, Arizona.

Idaho Transportation Department Connects Field Crews with ArcGIS Online

Web-Based, Cross-Platform Mobile Application Is Just the Ticket

Once considered part of the American Wild West, today the state of Idaho is a large, sparsely inhabited state. It is a land of contrast, with spectacular mountains, deep gorges, and nine national forests covering two-fifths of the state. Most of the state's population lives in the semiarid southern Snake River Plain, a land of rolling hills, in marked contrast to the rugged, mountainous central and extreme eastern parts of the state. Naturally, Idaho's roads link all this diversity together.

The Idaho road network is administered by the Idaho Transportation Department (ITD). ITD has jurisdictional responsibility for almost 5,000 miles of highway and more than 1,700 bridges. The remoteness of much of this network is a key challenge to many of the ITD field crews. Hauling equipment for inspection and repair over large distances to uninhabited areas makes the work both difficult to do and coordinate. Often, cell phone access is not possible.

ITD is organized into six districts. ITD District 6 covers the northeastern portion of the state. In 2012, Bill Shaw, a project engineer and manager of the Planning and Public Involvement Section in ITD District 6, turned his attention to overcoming some of the challenges faced by

ITD. The purpose was essentially twofold. First, streamline by moving away from the paper-based system used by field crews and reducing the number of data silos within the district. Second, install a mapping system to better coordinate field-workers and share information within the agency and with the public. ArcGIS Online was to be the technology at the center, given its potential to provide a unified solution. The goal was to build a mobile application targeted at field crews, which leveraged ArcGIS Online and helped demonstrate the capabilities of this new platform to ITD District 6 and the wider organization.

Project Planning

ITD District 6, under Shaw's guidance, was looking to work with a US-based company with ArcGIS Online expertise, which specialized in the development of mobile applications. He narrowed the field down to WebMapSolutions, a GIS software company and Esri partner based in Salt Lake City, Utah, specializing in the development of both web and mobile GIS applications. Much of the company's focus is now on ArcGIS Online. Given this in-depth knowledge of ArcGIS

→ The IDT Mobile Interface

Online and mobile development, ITD District 6 commissioned WebMapSolutions to help with this investigation. The work was funded by the US federal government and closely supported by Esri under the American Association of State Highway and Transportation Officials Technology Implementation Group UPlan initiative. The mobile application planned was to provide data collection and editing capabilities to field crews. So inspections of ITD assets, such as culverts, would be done using a tablet-based mapping application instead of pen and paper. Feature attributes could be updated, new features added, and images attached to individual features and then uploaded to ArcGIS Online directly from the mobile device. Given the lack of Wi-Fi access in much of the state, a key requirement of the mobile app was for it to function in both connected and disconnected modes.

Mobile Data Editing App Project Phases

WebMapSolutions took a two-phase approach to the development of the mobile editing application. In the first phase, a technical investigation was undertaken, the planned end result being a working prototype. The second phase targeted a production release.

Mobile technology continues to evolve. There are two "flavors" of mobile apps: those accessed via a web browser and those that are installed and can be downloaded from the Apple and Android mobile app stores. In phase 1 of the project, it was decided to develop a web-based, mobile, cross-platform application built in HTML5.

Phase 1 was successfully completed at the end of 2012. Since the data had originally been published in ArcGIS for Server, it was decided to simply optimize the data and remain focused on mobile development. ArcGIS Online was to be part of the second phase. Many technical questions were answered in this first phase and application workflows and design put in place. This work and what was learned would help guide the next phase.

Work began on phase 2 of the project in January 2013. Phase 2 specifications included the following:
• Publishing and accessing data through ArcGIS Online
• Greater focus on the data, most notably the application of the Transportation Data Model
• The ability to use the mobile app in disconnected or offline mode

ArcGIS Online was an important addition to this second phase of the work. The use of this new platform offers both short- and long-term benefits. From a development perspective, the mapping platform simplifies the code required. ITD District 6 staff can now publish web maps without the need of specialized GIS knowledge. Given the new requirements, most notably offline data access and editing, it was decided to develop an installed application in place of a web app. Adobe's Flex was used in place of HTML5.
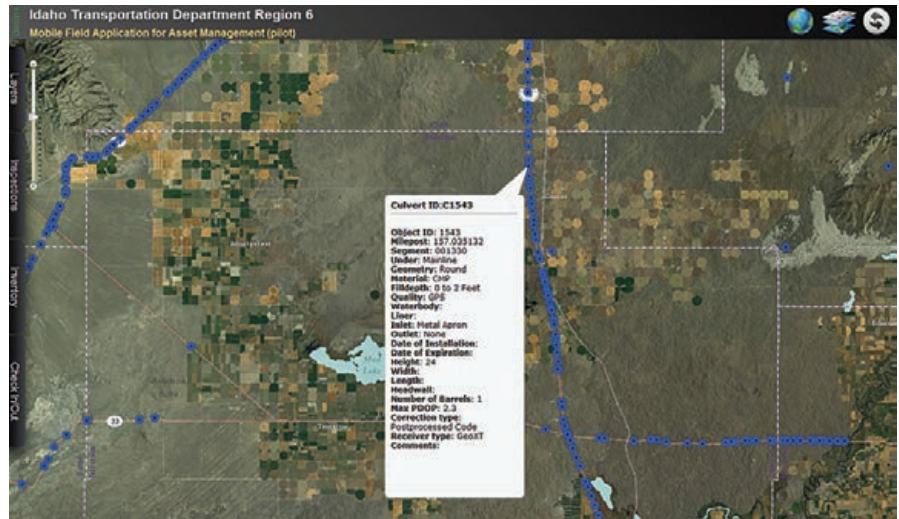
Online/Offline Mobile App Development

The mobile application was designed to be intuitive. In areas of poor or no Wi-Fi service, users have the option to switch to offline mode. When offline, the data used by the app is local, or stored on the mobile device. Features can be added, edited, or deleted. Feature attachments—images, audio, and video—can also be included. When back within Wi-Fi range, users can upload the changes to the mapping platform.

An important finding in the first phase was performance degradation when more than 1,500 editable features were visible. Both map panning and zooming were slow with a large feature count. ITD District 6 is subdivided into field office areas. Since field crews operate from these offices, servicing these areas, it was decided to publish web maps for each field office area. Crews operating from each field office loaded their own web maps in the mobile app. This eliminated potential performance issues and provided field crews with targeted, task-specific data.

The mobile app was designed to be highly configurable. It relies on a configuration file, which allows administrators to not only control the web map consumed by the app but also the look and feel of the interface (logo, title, and color).

Looking Ahead

Phase 2 of this development effort was ongoing during the first quarter of 2013. Providing new tools to ITD District 6 field crews is the immediate goal. ArcGIS Online, as a mapping platform, helped overcome the organizational and data access challenges currently faced by ITD District 6 and other ITD districts.

For more information, contact Bill Shaw, project engineer and manager of the Planning and Public Involvement Section in ITD District 6, or Matt Sheehan, principal at WebMapSolutions.

Geospatial Technology Saves Commuters Time and Money on the Illinois Tollway

Tollway Customers Use Trip Calculator and Interactive Map to Figure Out Toll Costs

A new online mapping application created using geospatial technology from Esri helps drivers on the Illinois Tollway plan their routes and calculate what they will pay in tolls before they leave on their trips, saving them time and money. The Illinois Tollway's Trip Calculator at www.illinoistollway.com has proved popular with tens of thousands of people who travel on the 286-mile tollway system in northern Illinois.

The application's interactive mapping component also helps drivers who have accidently missed paying a toll while on the road to view the route they traveled, calculate the toll, and connect to a section of the website where they can pay the missed toll online and avoid fines. More than 80,000 customers make online toll payments every month.


↑ Users can call up photographs of oases, where they can stop to purchase gas, meals, or snacks.

"The Trip Calculator is the easiest way for our customers to get clear, accurate information about the toll rates on our system," said Illinois Tollway executive director Kristi Lafleur. "It allows customers to customize their travels on the tollway and access the information they need with a few simple mouse clicks."

The Illinois Tollway's GIS team developed the application using ArcGIS technology from Esri and Microsoft Corporation's .NET development platform. Work began on the Trip Calculator project in November 2011, and the tollway launched it in March 2012. Since then, the Trip Calculator has averaged more than 1,700 unique page views each day as of May 2013.

Mapping Out a Route

The easy-to-use Trip Calculator application provides a simple, visual way for customers to view their trip on the tollway and, based on

↑ The users can select entry and exit points by right-clicking on the map.
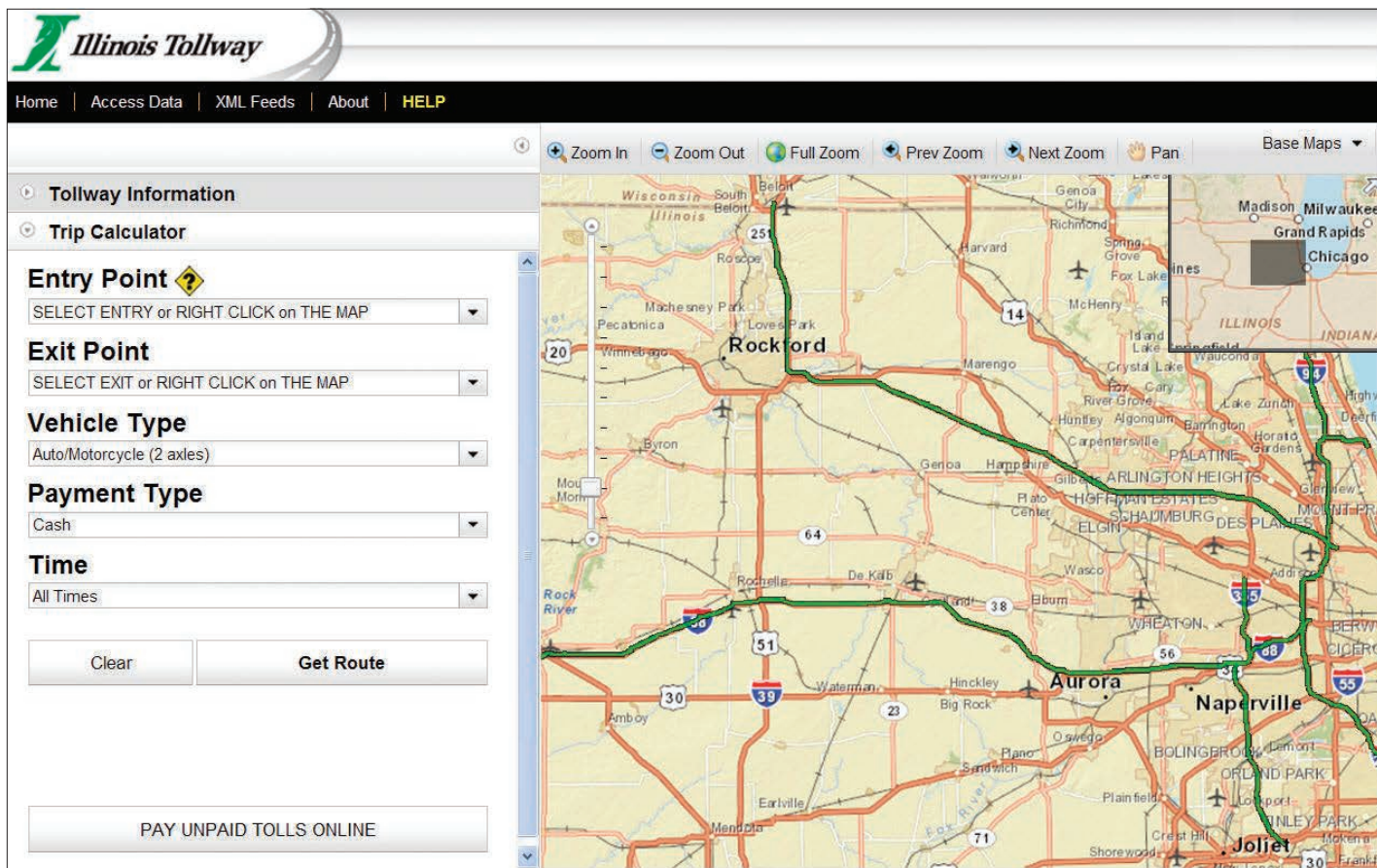
↑ Trip Calculator users start on this page to plan their routes and determine toll charges.

the type of vehicle being driven, calculate the toll charges for that trip.

Drivers first select their route on the tollway by choosing entry and exit locations from a drop-down menu on the calculator or by right-clicking on the application's interactive map and placing virtual pushpins at the start and end points of their trip. Next, they add their vehicle type (auto/motorcycle or small, medium-size, or large truck). Then they choose whether they want to use cash or the less-costly I-PASS. When they click Get Route, the application generates a route on the map, and the calculator tabulates the total toll amount. The application also displays the name of toll plazas where toll payments are collected.

Developing the Application

The GIS staff at the Illinois Tollway built the mapping application using Esri's ArcGIS API for JavaScript, mainly because it's mobile friendly. The API gave them the ability to easily embed maps into web pages and serve the maps on mobile devices. Customers can view the maps on Android devices and iPhones.

ArcGIS API for JavaScript is a free, browser-based API for developing high-performance, easy-to-use mapping applications. The GIS staff also used existing sets of NAVTEQ data with Esri's ArcGIS Network Analyst software. Used in conjunction with the NAVTEQ street network map, Network Analyst calculates the most efficient routes of travel on the tollway system and performs a geospatial operation to determine the location of intersecting toll plazas after a customer selects the start and end points. Esri's ArcGIS for Server powers the mapping application.

Mapping Additional Tollway Information

The application was added to Illinois Virtual Tollway, an online map launched in 2008 to provide information to travelers and serve as a single point of 24/7 access for infrastructure-related information for tollway staff, consultants, and partner agencies for Illinois tollway construction projects.

Besides calculating toll charges via the route driven, the Trip Calculator offers drivers the ability to view the rates by clicking on

individual toll plaza locations highlighted on the map of the tollway system. (Tolls vary by road, toll plaza, and ramp.)

The Illinois Virtual Tollway map also contains a fount of information for travelers, including the locations and pop-up photographs of Tollway Oases, where drivers can stop to buy meals, snacks, and fuel. People also can view milepost markers virtually and see where construction lane closures are in effect.

Through the use of Extensible Markup Language (XML) data feeds, public or partner agencies can seamlessly incorporate the tollway's daily lane closure report into their own websites, further expanding public access. The Trip Calculator is one of many enhancements the Illinois Tollway has made to help customers access the information they need, when they need it, on the tollway website.

For more information, visit www.illinoisvirtualtollway.com.

On the Road

Dubai Ramps Up Enterprise GIS to Serve Transportation Plans

The Dubai Roads and Transport Authority (RTA) recently revamped its geospatial system with Esri ArcGIS for Server. RTA's new enterprise GIS provides improved data access, allows better management of geospatial data, and facilitates integration with other RTA systems.

RTA's new system enables access to geospatial data for non-GIS clients. It uses service-oriented architecture-style GIS web services, providing an operational focal point for delivering access to all RTA's geospatial data, services, and applications. All Dubai civic staff members can visualize their own data against a variety of common versatile basemap services.

RTA agencies can also perform web-based editing for easy management of GIS layers, freeing up desktop licenses and providing a secure and centralized method for data management by each agency. A portal also allows RTA business users to extract and download data on demand.
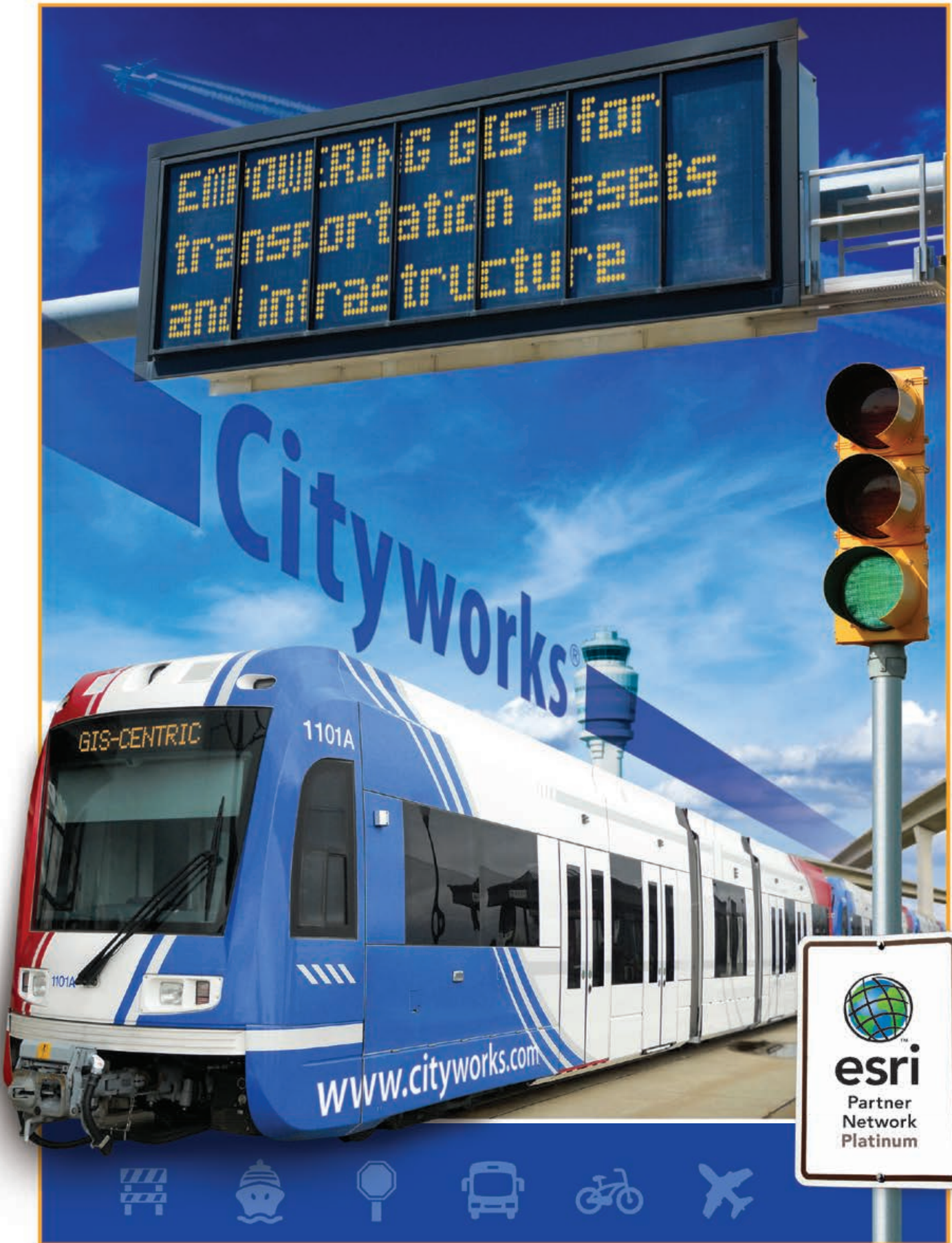
The RTA enterprise GIS is interoperable with CAD, allowing CAD clients to connect, download, update, and post changes back to the geodatabase. Dubai's GIS staff uses Safe Software FME to give RTA business users a web interface for converting GIS data into CAD format. This feature has allowed RTA to upgrade the enterprise GIS while maintaining compatibility for various versions of CAD clients for some of the specific tasks.

RTA intends to further expand its system with mobile GIS. Plans are in the works to exploit Esri mobile apps for field data collection and executive dashboard capability.

For more information, contact Hanan Bajash, GIS manager, RTA, at hanan.bajash@rta.ae.

↑ The RTA GIS portal allows all agency staff members to visualize and manage their respective GIS data.

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