

Where GIS and GPS meet

Mobile GIS technology plus mapping data equals accurate and swift decision making

— Rose Robinson

As geospatial information begins to play more of a critical role in mainstream business and government decision making, industries and sectors with traditional geospatial information systems (GIS) are scrambling to find a cost-efficient and effective way to share their geospatial assets and intelligence with those who have no idea what the acronym GIS stands for.

GIS departments around the world have long prided themselves on the extensive data and maps that they have created. And as the traditional GIS software vendors begin to expand across the enterprise with remote sensing solutions, many GIS experts have their vision set on an end-to-end solution as the ultimate destination. There is a strong desire for a landscape that allows all of the data sources to talk to each other and coexist in an infrastructure that makes it easier for GIS users to manage and more efficiently generate accurate, current maps that their organizations need.

Unfortunately, this vision doesn't account for the hundreds, and in many cases thousands, of people who need access to those maps and images to do their jobs. These people include the utility workers who are charged with maintaining transformers, the fire fighters who are trying to control a California wildfire, and the homeland security response teams who need real-time data on-the-fly to make immediate decisions. Having the ability to access and collaborate with geospatial assets remotely will allow field personnel to share vital information with their peers and with their geospatial headquarters. Sharing geospatial data, maps, and images in a manner that the non-technical GIS users can consume has historically been one of the most overlooked initiatives in the industry. Organizations have invested millions of dollars in their geospatial assets—such as GPS, smart phones, and bandwidth—but the limitations of technology have impeded their ability to extend the reach and utility of this investment to their enterprise.

Gone is the way of the past

Traditionally, collaboration amongst peers has meant everyone coming together into one room or on a conference call and discussing a topic or mapping out plans with a pencil and paper. For many kinds of information, this is the only practical method. But for large data volumes that must be structured for data processing and workflow activities, these forms of peer interaction have been shown to be ineffective and labor intensive, resulting in duplication of effort, high error rates, delayed response, and, in the case of disaster response, the loss of federal assistance. They also provide no ability to capture photographic or video evidence which may be needed to substantiate or interpret the data being assessed.

In order to streamline processes, paper and pen were thrown out, and computer-based data capture methods have been employed, resulting in either stand-alone digital maps and/or map-based systems. Digital maps are straightforward to deploy on both laptop and mobile GIS devices, but lack any location-based context. Some digital maps include GPS location stamping, but they still cannot fully assist the user in determining



their position relative to their work environment.

Map-based systems utilize forms for data collection but they include a map representation of the work area, frequently displaying the user's location via a GPS device. This is invaluable for ensuring that the data is correctly associated with the facility or area being described, as well as providing navigation assistance to the user. Unfortunately, current products require the user to be knowledgeable about the GIS system interface, and they lack the ability to capture multimedia data (such as video, audio, and photos). Furthermore, they frequently depend on wireless connectivity for full functionality, which may not be available in a post-disaster environment.

GIS on the cutting edge

File-based mobile technologies, built with disconnected map display products that are designed to capture location-specific event data in several formats, including forms, photographs, text notes, video and audio, will not only compliment daily tasks, but will impact the virtual workforce through increased productivity and connectivity. The ability to package event data so that it can be consumed by GIS systems, Adobe Reader and Acrobat and other devices will prove to be key for maintaining a market edge. The result—a human-based application that is mobile, can capture data in multiple formats, and can submit this data to many other systems used to process and analyze the data.

Given the attention given to the workflow of data collection and collaboration, mobile applications enhancing these specific attributes will dramatically improve business processes and productivity for industries such as surveying, mapping, and resource management. The real benefit will be demonstrated by having workers out in the field collecting data with mobile applications and feeding it back into a geospatial database. This alone will redefine business models and improve the workflow for many organizations.

Caveats to mobility

When it comes to developing mobile GIS technology, one of the biggest challenges organizations face is keeping up with the latest mobile device technology. With a new device released on an almost monthly basis, the question becomes: Which

device do you equip your team with? Most original equipment manufacturers have mobile devices that are specifically geared toward particular markets. One way manufacturers help offset this challenge is to include in their products some popular, key features, such as GPS and data/Internet access.

Operating systems can also prove to be a challenge. End users are familiar with or have heard of Blackberry, Windows Mobile, and the iPhone. With the introduction of Google Android, a new player in the market that will operate under T-Mobile, developers are ramping up efforts to collaborate and integrate with this system. Such developments serve as true market drivers for mobile technology.

Regardless of what challenges are presented, mobile technology provides innovative methods for collaborative field data collection and as such, it will prove to be a critical and integral component of GIS modernization and improved business processes. Organizations have long been confronted with the need to provide their field personnel with information necessary to complete their jobs; for example, a utility worker using an antiquated paper map on a service call to repair a damaged pole may need to call in for additional information because work on a new housing development has necessitated the removal of the pole to another location. How is that new information recorded and updated? Addressing real problems and providing real solutions is key to streamlining GIS workflows while maintaining accurate geospatial data. And it will be mobile technology and mobile GIS applications that will transform the survey and mapping industry.

Beyond mobile

Computer and Web-based technologies have already changed the way organizations conduct business; and there's no doubt that mobile technology will revolutionize business communication and collaboration in a broader scheme. Customer demand for mobility and new features and services will continue to exert pressure on equipment manufacturers, service providers, and mobile operating systems to deliver service-oriented mobile solutions for business and personal use. With new mobile technologies, accessing geospatial assets through a web service from a mobile device is a solution that will provide enterprise collaboration.

Multi-media messaging service (MMS) and GPS entered the market heavily, commanding the development of mobile devices with new features. Usability and convenience will continue to influence the design and functionality of mobile applications, as well as their features and services. One example is the push for voice commands coupled with GIS functionality. Instead of pressing a button to take a photo, simply say, "take photo," and it is automatically attached to the appropriate location on a map. This functionality eliminates such steps in data collection as annotations and feedback while inspecting or surveying an area.

In the GIS industry, access to up-to-date data by field personnel results in streamlined workflow during data collection. Accessing information databases via the web or through mobile database connectivity is no longer a dream. This happens when in-office GIS personnel prepare data from Dynamic Mapbook Server, a



solution developed by TerraGo Technologies, and distribute it to field personnel—in the form of multi-media, documents, or maps, so as to automatically produce geo-enabled PDFs—who then have real-time access to it.

The Dynamic Mapbook Server is unique in that it integrates with geospatial databases and geospatial content management systems. The architecture of the server is such that it can communicate through web services and produce geo-registered PDFs in an organized mapbook.

Imagery enhancements on mobile devices is another area receiving much research attention. Geospatial assets have traditionally been delivered in two-dimensional form. However, because imagery is of vital importance in mapping technology, and given the recent introduction of 3D features, the ability to view 3D maps and imagery—with accompanying tools to manipulate the images—is definitely on the horizon.

A shift in workforce mentality

Just as GeoPDFs paved the way to leveraging PDFs on the Adobe platform so as to enable geospatial applications that meet the needs of all types of end users, regardless of GIS expertise, so are handheld devices offering enhanced mobility to users across the globe with interactive maps. All industries and sectors will benefit from mobile technologies by being able to make accurate and swift decisions when GIS data is easily available to anyone, anytime, anywhere.

A drastic change in the workforce is currently underway due to an increasing shift toward a mobile mentality. There is a new generation workforce, and they are pushing mobile technology and driving the development of enhanced features on handheld devices. From county commissioners trying to explain future community development plans on-site to deployed U.S. soldiers mapping an area for reconnaissance, the need for disconnected users to access easily geospatial data to make decisions is paramount.

There's no question of the enormous and still growing need to view, annotate, and configure maps in order to help field personnel respond more efficiently to their changing conditions—and to have a way to do this without having to learn and maintain a complex GIS application.



About the Author: Rose Robinson is the director of product marketing for TerraGo Technologies (www.terragotech.com), a provider of software solutions that extend the access and application of geospatial data to professional consumers. Robinson was instrumental in the development of

TerraGo Mobile, a solution that enables non-technical users to capture, share, and reuse configurable maps in PDF format on mobile devices.