GIS You Can Depend On

ESRI and Citrix solutions enable business continuity for local government.

After a series of tornadoes struck Indiana in 2002, geospatial data provided vital guidance to emergency crews unfamiliar with the disaster sites, which stretched across 32 counties.

When a massive complex of wind-driven wildfires erupted in 2003 in Southern California's San Bernardino National Forest, GIS again was a crucial lifeline. The technology directed firefighting efforts, tracked the progress of the blaze and guided evacuation efforts.

And following Hurricane Katrina in 2005, GIS maps helped officials assess the devastation and begin plotting recovery efforts.

These recent events illustrate the criticality of GIS delivery to emergency managers, first responders and recovery planners. As GIS technology has matured, emergency managers and first responders have come to rely on these tools for a range of life-or-death scenarios.

Because geospatial information is so important to emergency response — as well as general government operations — it's crucial that GIS-based resources remain operational during an emergency.

Geospatial assets must be available wherever and whenever needed — for emergency crews in the field, for policymakers at agency headquarters and for planners at remote offices. In worst-case scenarios, GIS resources also must be available to displaced government work forces that may be directing operations from makeshift facilities after a severe disaster.

Meeting these growing disaster-response and business-continuity needs requires that GIS resources become more networked and service oriented. ESRI and Citrix partner to

deliver GIS solutions using a service-oriented architecture (SOA) model that delivers geospatial resources as secure, disaster-tolerant Web services. This approach treats GIS technology as a vital organizational resource, on par with other mission-critical systems and computing frameworks.

The combination of ESRI GIS server technology and Citrix application delivery infrastructure enables government agencies to securely deliver GIS information and functionality to any location, while at the same time protecting sensitive data stores. Additionally IT managers can avoid costly downtime caused by natural or man-made disasters and minimize disruptions to productivity when workers are indefinitely displaced due to circumstances beyond their control.

Secure Delivery of Geospatial Information

When combined, ESRI and Citrix solutions deliver sophisticated security and access control functions that allow users to reach appropriate data and information from any device in a secure fashion. For example, Citrix application virtualization keeps GIS application data secure in the data center, behind the government firewall. Only screen images are sent from the server to the end-user's computer, and when the device is shut down, no data remains on it. So a lost or stolen computer simply means a monetary loss, not a security breach. In addition, ESRI's server GIS technology provides the security architect the flexibility to integrate trust across all ESRI components of the solution.

As a provider of secure enterprise GIS solutions, ESRI ensures that its products integrate with other hardware and software controls to meet the basic security requirements of confidentiality, integrity and availability. Using ESRI tools — and integrating with other specialized security systems and security controls inherent in other architectural components — administrators can implement data protection strategies at the application, network, operating system and relational database management system (RDBMS) levels. The SOA of ESRI's server-based technology adheres to IT standards, providing maximum interoperability and compatibility with enterprise architectures.

These integration capabilities have benefits beyond security. With server-based GIS, Web applications and services are integrated into the broader IT landscape in support of various business workflows. Therefore, GIS data can be integrated with systems that handle work order management, financials, supply chain management, business intelligence reporting and executive dashboards.

Citrix also offers an SOA approach for delivering all classes of applications with the highest security, lowest cost and fastest performance. These include virtualization for client-server applications, optimization for Web applications and streaming for Windows. Citrix product families are built to work with each other and to work immediately with any IT infrastructure — no matter how distributed and diverse. Collectively Citrix products and services help government agencies improve the efficiency of IT operations and support government mandates.

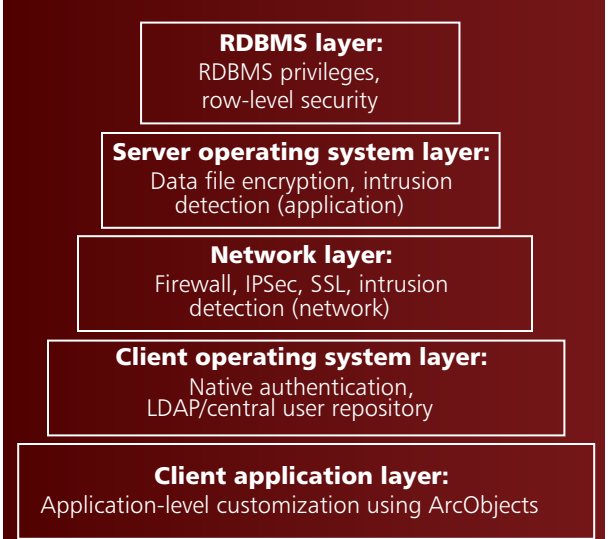
The ability to securely access GIS data from any location empowers workers to complete their duties, no matter the complexity of the operating system. They can reach important information and applications even if they're displaced due to an emergency or other event. Mobile workers and emergency responders can access crucial GIS data wherever and whenever they need it.

Improved End-User Experience

Besides strengthening security and business continuity, the ESRI/Citrix solution makes agency work forces more effective. Government employees outside of the IT department don't have time to be concerned with hardware, network and operating system details. They simply demand a user-friendly application and uninterrupted access to the information they need. This is particularly true for the growing number of public safety and emergency response professionals using

Secure From Top to Bottom

ESRI ArcGIS integrates with all components of enterprise architecture, allowing administrators to implement security measures at the application, operating system, network and RDBMS levels. The following are some tools to secure geographic data in ArcGIS:



ESRI/Citrix solutions securely deliver GIS data to a growing number of users, no matter where they are.

GIS technology. ESRI/Citrix solutions treat GIS data as an enterprise resource, so everyone who needs it receives the latest, most accurate spatial information. Simple, geo-enabled, Web-based ESRI applications delivered through secure Citrix application delivery mechanisms extend the value of GIS throughout the enterprise, even to mainstream users who lack GIS expertise. Government workers who access GIS services — either in the field, at remote offices or at home — can depend on the same desktop experience they expect with a traditional network connection in a "normal" office location.

In addition, all applications are accessed through one secure gateway with a single password. This minimizes training and technical support requirements. If an employee is displaced, ESRI/Citrix solutions seamlessly reconnect him or her to applications and documents regardless of the computer he or she uses. These solutions are device- and browser-agnostic, meaning they instantly plug into any hardware or browser.

And ESRI/Citrix solutions include Web acceleration technology that makes applications more responsive for end-users. For example, a Web task that normally takes 10 seconds takes one second, thanks to the way the Web acceleration technology from Citrix handles Internet protocols.

ESRI/Citrix solutions centralize management of GIS applications and data, and load-balancing technology ensures consistent access to necessary data — even if a large group of users signs on simultaneously. This gives end-users better performance and the ability to complete tasks without distractions or frustrations caused by poorly functioning applications. Agencies can make geospatial information available to more users by eliminating the need for extraneous and often confusing client hardware and software.

As GIS data and applications become even more fundamental to all government operations, ESRI/Citrix solutions ensure these resources respond to the challenges facing CIOs and agency executives by providing better security, business continuity and optimized application performance. Their cost-effectiveness and ease of use allow agencies to provide more users with GIS information in a secure, reliable environment.

The Right Approach

Securely rolling out GIS data to public employees, mobile workers and concerned citizens is challenging for governments. And ensuring operational continuity — no matter what happens — is now a key concern for government CIOs and IT managers nationwide.

ESRI/Citrix solutions create enterprise-class Web services that reliably and safely deliver geo-enabled applications and services — regardless of location or circumstance.

Together, ESRI/Citrix solutions empower crucial government operations to continue in the face of adversity, and public work forces — first responders, emergency planners, policymakers, inspectors and others — get the resources they need, when they need them.

Taking It to the Next Level

Citrix's service-oriented architecture approach to business continuity solutions across the enterprise enhances security and performance for end-users on the network or remotely connecting. Users have the same experience anywhere they access data and administrators don't worry that their data will be compromised by permitting remote activity.

- Application delivery mechanisms ensure security and performance for end-users — no matter where they are.
- Access control mechanisms, such as password and encryption, prevent unwanted guests from accessing applications and data.
- Policy-based controls allow administrators to control access to data based on such variables as user permission, device type and location.
- Easy integration with other systems and solutions allows administrators to apply policies across applications and integrate with additional authentication devices, such as biometric readers or smart cards.

Preparedness in Pasadena

ESRI and Citrix help the city of Pasadena ensure business continuity during emergencies.

Earthquakes, wildfires, windstorms — in Southern California, they're taken with a grain of salt. But once in a blue moon, these events take on epic proportions.

From the deadly 6.7 magnitude Northridge earthquake in 1994 to the devastating wildfires in the San Gabriel Mountains nearly a decade later, communities in Los Angeles County have responded proactively, dusted themselves off, rebuilt and gone back to business as usual.

Cities in L.A. County have plenty in common, including coordinated emergency preparedness and response. For many, this evokes images of police officers and firefighters doing their duty. As any city official can tell you, however, there's much more to it than that.

Just 10 miles north of downtown Los Angeles, the city of Pasadena is a stellar example of how technology and emergency preparedness go hand in hand. Designed especially for concerns ranging from local disasters to emerging global issues, the city's ESRI-based GIS provides information about critical infrastructure to the organization during emergencies. These include detailed maps of Pasadena's sewer network; water and power public utility information; a reverse 9-1-1 application that can call land-line phones citywide or within a specific distance of a hazard with updates during or after emergencies; mapping that can be accessed by public safety officers in the field; identification of critical data associated

with selected properties within neighborhoods affected by disasters; and much more.

To ensure this vital information is available in emergencies, the GIS database is housed in a hardened facility with generator backup power. The GIS database has a replicated copy running in the city's primary data center. Oracle's DataGuard is used to automatically switch users from the primary GIS database to the failover database.

Pasadena has gone to great lengths to migrate maps and asset information once stored on paper drawings in hallway file drawers. Most of these sources have been scanned and are now accessible via ESRI Web-based services and desktop GIS applications.

"Reliable access to information from any location is critical for seamless maintenance of vital infrastructure during emergencies and normal operating conditions," said John Pratt, the city's chief information officer. "ESRI and Citrix provide a number of solutions that enable information technology to work effectively."

Pasadena's recent agreement with ESRI reduced the number of applications running on end-user machines and freed up resources tied to hardware and software maintenance, resulting in savings that can be invested in improved continuity and security.

Pasadena is distributing mapping applications via ESRI Web-based software available to anyone within the city with a network connection. The city is also moving toward distributing many other thick client applications — mapping and non-mapping — via Citrix. The central management of enterprise applications via the Web and Citrix represents a fundamental change in the use of technology for Pasadena.

ESRI

For more information
www.esri.com\securegis
800-447-9778

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For more information
www.citrix.com/secureGIS
800-424-8749 ext 22319