Managing GEOINT

The key is to deliver "just enough" geospatial data to warfighters

BY JOHN EDWARDS

The U.S. intelligence community and military services face a growing need to extend geospatial intelligence sharing all the way out to the tactical edge. Yet as the amount of intelligence that's available for sharing relentlessly swells, the challenge of moving multiple terabytes of information to end users — from office-bound analysts to front-line warfighters — threatens to overwhelm existing distribution channels.

As sensors, databases and other information resources continue to expand, so does the number of fixed and mobile end-user devices. As a result, the challenge facing system and network developers now extends from the front end to the back end of the chain — from how geospatial intelligence is collected to how it is displayed to analysts, warfighters and other GEOINT users.

FINDING SOLUTIONS

The National System for Geospatial Intelligence in its 2013-2018 strategy, issued in April, pledged to "establish a dynamic and agile enterprise architecture that enables the optimized use of GEOINT through interoperable processing, exploitation, and dissemination capabilities." The document also noted that NGS "will promote the interoperability and fusion of data and information systems to ensure compatibility and applicability across the community."

Meeting these goals in an emerging era of big data GEOINT promises to be a major challenge. According to Scott Simmons, executive director of geospatial solutions for CACI International, the current collaborative environment will need the assistance of enhanced data discovery capabilities, driven by improved metadata and standards-based access to underlying GEOINT content. Simmons noted that information will have to be organized and prioritized in a way that makes data sharing and retrieval both efficient and relevant, particularly by tactical edge users.

"Given bandwidth and device limitations that will continue for some time, GEOINT delivered to the warfighter needs to include 'just enough' content to serve the mission and not be burdened with unnecessary data," he said.

GEOINT big data distribution will also have to be tailored to meet the characteristics and limitations of end-user devices, said Robert Mott, vice president of geospatial solutions for Intergraph Government Solutions (IGS).

"Such an environment will definitely include support for a wide variety of form factors, such as smartphones, tablets, laptops, wearable gear and other Internet-enabled devices, such as sensors and other data collection and reporting components," he said. "The ability to collect massive amounts of geospatial data real-time from systems and sensors needs to be balanced with delivering rich sets of geospatial information to the widest set of users possible, but in appropriate formats and representations which best suit the devices and missions."

Providing the ability to run real-time data analytics as Web services, which can deliver meaningful results in summary fashion to decision makers, will also be critical, Mott added.

GEOINT big data poses a unique problem for system and network developers, since end users require access not only to raw source content, such as full-motion video, satellite imagery, terrain measurements and other forms of sensor content, but also to derived content, including fused products, map feature data and analytic tools, all of which must maintain a chain of custody extending back to the source.

"Consistent and complete metadata for all of these types of content is critical to enable data discovery, and to ensure confidence for the user that the appropriate GEOINT content is being utilized for their mission," Simmons said.

Increased automated server-side processing for extremely large data sets, such as lidar and optical imagery, will be necessary to allow results to reach decision makers in minutes rather than hours or days, Mott said.

"The key will be to have a mechanism for sifting and distilling key subsets of the data to extract out key nuggets of information that can answer very specific questions," he said.

USING WHAT'S ALREADY THERE

Mott, like many other GEOINT experts, believes the U.S. military will need to base future development of the GEOINT collaborative environment at least in part on components and capabilities that have proven themselves valuable. Tools such as Hadoop Map/Reduce are already being used to create efficient platforms for geospatial cloud analytics.

"A key aspect to establishing a broader collaborative environment is to improve the overall amount of geospatial information sharing via open standards," Mott said. "The U.S. military, along with many other U.S. federal, state, local and international agencies, have adopted geospatial information standards from the Open Geospatial Consortium to effectively and reliably share a wide variety and large amounts of geospatial data, such as imag-

Army National Guard soldiers use geospatial data to plan missions in the tactical operations center during a nuclear attack response exercise in McCormick, S.C.

ery, terrain models and mapping information through vendor neutral interfaces."

Mott said such an environment will need to come online gradually.

"Since there are already current technologies that take advantage of big data processing and analytics, especially in the GEOINT community, the goal would be to learn lessons from those deployments and improve next iterations, as well as develop new technologies to extend the overall capabilities even further," he said.

Leveraging current big data technologies and methodologies also promises another important benefit.

"In today's environment of shrinking DoD budgets, it will be imperative to leverage existing and emerging technologies to the greatest extent possible," Mott said. "There will no doubt be continuous investments in new sensors and systems to collect larger amounts of data in greater detail and at a greater frequency than ever before, which will dictate the investment in additional storage space and other hardware and network type components."

Such investments, however, will need to be matched with additional investments in the processing, exploitation and dissemination stages of the workflow to ensure that the maximum benefit is gained, he said.

Mott, however, believes the most important big data-related GEOINT challenges aren't directly related to technology or funding.

"The biggest stumbling blocks to realizing the greatest benefits of big data processing will be policy- and culture-based," he said. "The greatest insights will result when disparate data sets are analyzed in tandem."

For that to occur, Mott said, organizations will need to open up access to previously isolated data sets.

"Striking the right balance between security/privacy and providing broader access to support the broader missions will be a key aspect," he said. □