Geospatial Intelligence Forum

2011 USGIF Membership Directory

Geospatial Advocate

Dr. Joseph F. Fontanella

Director, Army Geospatial Center Army Geospatial Information Officer

GIF

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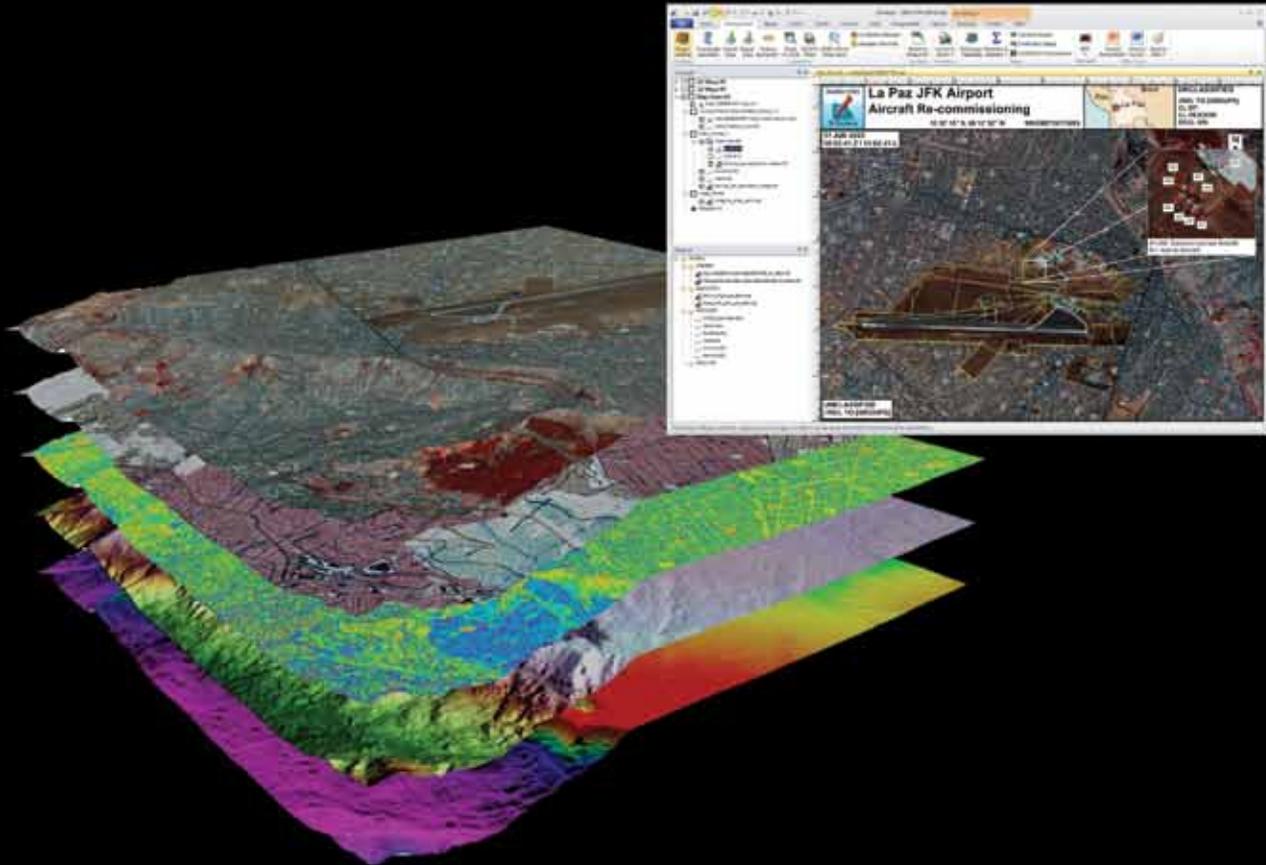Defense ☆ Intelligence Homeland Security

May/June 2011

Volume 9, Issue 4

Synthetic Aperture Radar ☆ EnhancedView Satellites ☆ Cross-Domain GEOINT

Features

2011 USGIF Membership Directory — Special Pull-out Section

A guide to the organizational members of the U.S. Geospatial Intelligence Foundation, with listings of contact information, company descriptions and capabilities, produced by *Geospatial Intelligence Forum*.

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EDITOR'S PERSPECTIVE

With early backing from the National Geospatial-Intelligence Agency, a new cloud computing service from Google is poised to make a major impact on the way organizations store and distribute geospatial data.

In recent years, Google Earth and other services have dramatically changed public perceptions by making satellite and street-level location imagery readily available to consumers. Similarly, the recently announced Google Earth Builder could transform enterprise use of geospatial data by bringing the company's powerful computing resources to bear on the challenges of using massive amounts of imagery and other digital data.

Harrison Donnelly
EDITOR

With the new service, government agencies and other organizations will be able to upload their own geospatial data onto Google servers. Then employees, customers and partners will be able to use Google Earth tools to access and analyze the information from anywhere via a Web browser. Essentially, the service will make the infrastructure developed for Google Earth available to organizations for a fee, rather than bearing the cost of developing and maintaining their own system.

"It's not very easy to build maps today," Dylan Lorimer, Google enterprise geo product manager, was quoted as saying. "But these are problems that Google has solved."

According to the company, the service will offer a number of benefits. During a crisis such as a natural disaster, for example, the cloud platform would be able to manage unanticipated spikes in user demand. It would reduce the cost of maintaining, scaling and updating software and servers, while also offering greater control of source data and attribution. In addition, organizations could process complex geospatial data quickly and efficiently, complemented by Google's extensive basemap of imagery and roads.

Google Earth Builder is expected to become available on the market later this year. The company has already announced contracts with NGA and Ergon Energy, an Australian company that has been testing the service.

Harrison Donnelly

⠃ PROGRAM NOTES ⠃

Army GEOINT: Joining Engineering and Intelligence

What's happening with U.S. Army geospatial intelligence? The engineering and intelligence communities are together at last. While some are skeptical, many professionals are celebrating the long overdue union of these two disciplines.

Regardless of perspective, accomplishments and advancements made in the Army GEOINT enterprise in the past year are numerous and tangible.

Last fall the Army formally redesignated its operational imagery intelligence battalion from the 3rd Military Intelligence Center to the Army GEOINT Battalion. This organizational move officially recognized the emerging mission of this unique command as a GEOINT producer and an official contributor to unified GEOINT operations. The new name also reflects the mission it executes on a daily basis.

"Delegating GEOINT production responsibility baseline target analysis to the Army GEOINT Battalion allows us to align more with the newly developed Southern Command joint intelligence staff unified government operations directive," said Ezell Powell, Integrated GEOINT Division chief at the 470th Military Intelligence Brigade.

The battalion now has more than just military and civilian imagery analysts; a civilian geospatial analyst and a military geospatial engineer work alongside their imagery intelligence partners. Additionally, efforts are underway to include additional GEOINT disciplines within the battalion. Through the foundry program, and in collaboration with the National Geospatial-Intelligence College, the battalion's GEOINT Sustainment Training Facility provides an adaptable, relevant curriculum for soldiers heading to theater. It ensures proficiency in the most recent and applicable GEOINT methodologies.

Next, the Army is in the process of institutionalizing GEOINT cells from brigade combat teams to Army service component commands, integrating imagery intelligence and geospatial engineering disciplines. The GEOINT cell will synchronize unique and complementary capabilities to meet the needs of the commanders at each echelon without a manning increase. This structural change, along with GEOINT support teams at deployed locations and NGA support teams at stateside Army garrisons, gives tactical commanders a multifaceted approach to leverage all aspects of the National System for Geospatial Intelligence. Meanwhile, the Army and NGA are reviewing the line of demarcation to determine how to best complement the capabilities of each organization.

Efforts are also underway for geospatial engineers and imagery analysts to train together at the U.S. Army Intelligence Center of Excellence at Fort Huachuca, Ariz., by replicating a GEOINT cell in a training environment. The Joint Intelligence Combat Training Center conducts live environmental and situational training exercises to challenge soldiers to find creative solutions to intelligence problems. With the assistance of the National Geospatial-Intelligence Agency support team at Fort Huachuca, the center drafts scenarios that mirror the complexities and environment of the current battlefield.

Excerpted from an article by Lieutenant Colonel Jason Strickland, military executive, Army GEOINT Office, that appeared in the May/June 2011 issue of the National Geospatial-Intelligence Agency's Pathfinder *magazine.*

⠃ PEOPLE ⠃

Vince Minerva

NJVC has added **Vince Minerva** to its senior management team, where he will direct the development and execution of comprehensive,

measurable, strategic initiatives to broaden NJVC's presence into adjacent markets, services and solutions. Minerva previously was with BAE Systems.

Army **Lieutenant General Thomas P. Bostick** has been nominated for appointment to the rank of lieutenant general

and assignment as chief of engineers/ commanding general, Army Corps of Engineers. Bostick is currently serving as deputy chief of staff, G-1, Army.

Avineon, a provider of IT, geospatial, engineering and program management services, has announced the appointment of

Rick Baumgartner as director of business development-geospatial solutions.

Michael G. Vickers

The Senate has confirmed **Michael**

G. Vickers as undersecretary of defense for intelligence.

David Ryan

Northrop Grumman has named **David Ryan** vice president

and general manager of its Intelligence Systems Division, one of five divisions within the company's Information Systems sector. He reports to Linda A. Mills, corporate vice president and president of Northrop Grumman Information Systems.
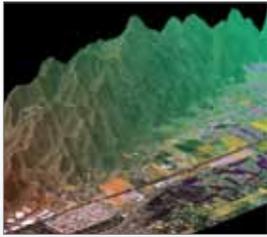
The Defense and Intelligence community relies on ENVI software products to provide them with scientifically proven image analysis tools. From topographic analysis and terrain categorization, to target detection and feature extraction, ENVI products have the tools you need to turn imagery, like spaceborne satellite imagery and airborne hyperspectral imagery (HSI), into actionable intelligence. And, the newest version of ENVI delivers advanced image analysis tools directly to the familiar ArcToolbox®, so you can quickly and easily update your GIS with information from geospatial imagery.

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Satellite Imagery Shows Osama's Lair

As this issue was going to press, President Obama announced that U.S. forces had killed Osama bin Laden at a compound in Pakistan.

While details of the U.S. action were still emerging, analysts credited intelligence from a variety of sources for the critical information that made the action possible. In a statement, Central Intelligence Agency Director Leon Panetta thanked the National Geospatial-Intelligence Agency, National Security Agency and Office of Director of National Intelligence for joining together to apply "the full range of our capabilities, collecting intelligence through both human and technical means and subjecting it to the most rigorous analysis by our government's leading experts on Bin Ladin and his organization."

Shortly after the announcement, DigitalGlobe released satellite imagery from January 2011 of the Abbottabad, Pakistan, compound where the action took place.

Original Compound
(Perimeter Wall 175.7 sq m)

Additional Perimeter Wall

Additional Perimeter Wall

25.75 Meters

44 Meters

51.8 Meters

DigitalGlobe Panchromatic Satellite Imagery
January 15, 2011

DIGITALGLOBE
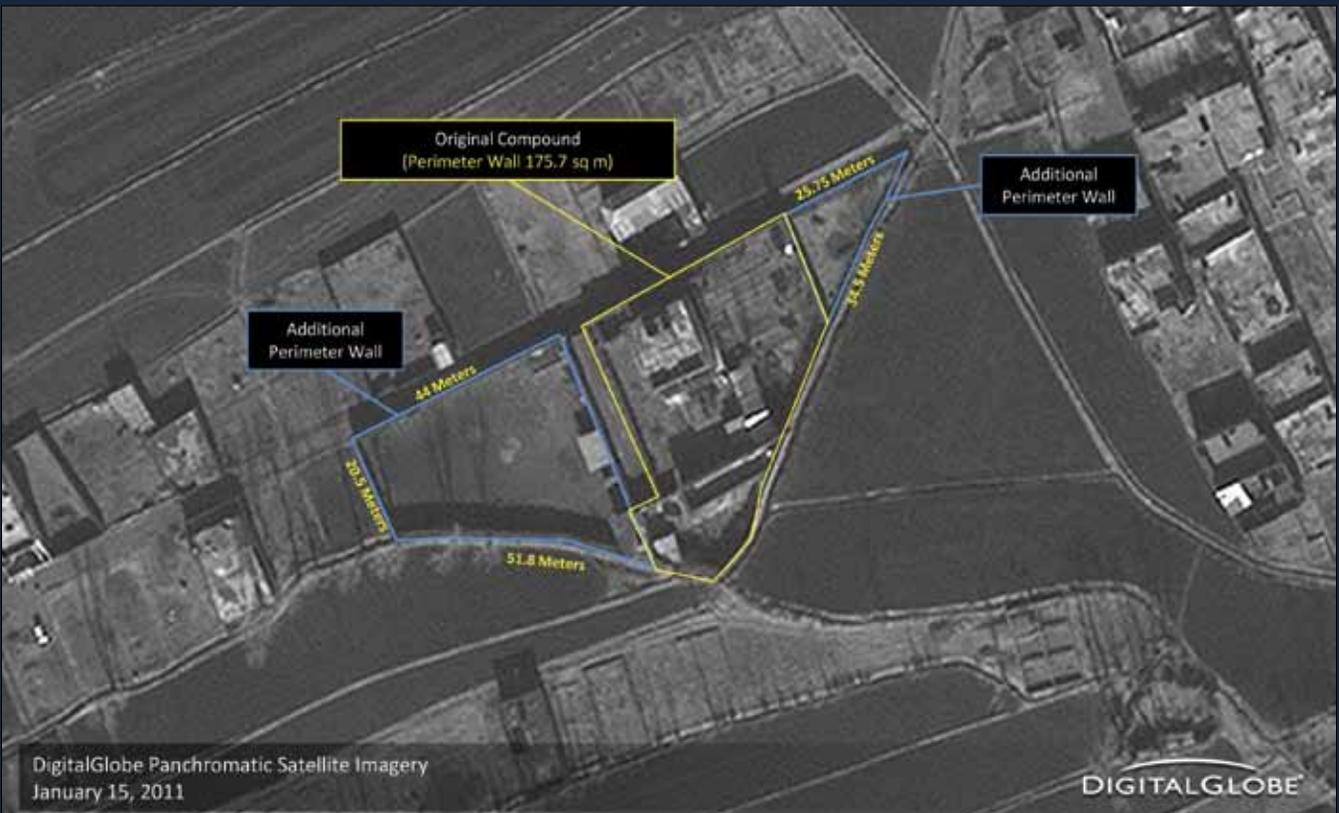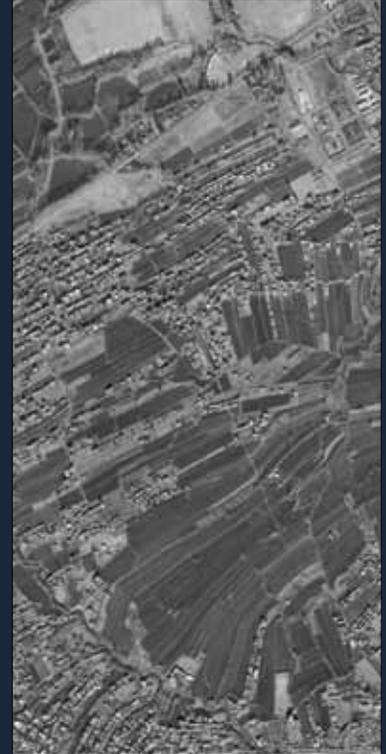
Keith J. Masback, President, USGIF

I'm writing this on the morning of May 2, sitting in New York's Times Square. There is quite a bit of "buzz" here given last night's news that Osama Bin Laden was killed by U.S. Forces in Pakistan. I think I'll leave it to the pundits to pontificate about the larger meaning of this historic event and simply narrow my reaction to just one thing: There seems little question at this point this was an intelligence-driven operation.

Press reports indicate an initial tip derived from human intelligence led the United States to engage all its other intelligence disciplines in an integrated way over many months for this successful mission. Focusing the assets of the intelligence community on this problem, the United States was finally able to track down "HVT #1." This is an intelligence success of the highest order—all made possible because of a fully integrated intelligence approach.

From May 9 through May 14, USGIF will present GEOINT Community Week, a weeklong series of events that highlight the importance of utilizing all intelligence disciplines together to solve our national security challenges. We are excited about the growth in this set of activities and see great potential for expanding further. The feedback and support has convinced us that we are doing something important.

Given the recent buzz of current events as well as the interest in GEOINT Community Week and the GEOINT 2011 Symposium, which takes place October 16-19 in San Antonio, Texas, we thought it might be a good time to introduce USGIF's theme for GEOINT 2011: Forging Integrated Intelligence.

The idea of better integrating intelligence isn't new. Some would argue that this goal dates back to the initial establishment of the intelligence community. To be sure, everything from fusing data at the earliest point, to the idea of "all-source" intelligence, to the

pursuit of the holy grail of "horizontal integration" a few years back, all focused on the idea that better integrated intelligence would be, well, better—better for informing policymakers, better for supporting commanders, better for enabling warfighters, better for protecting our national security.

Over the past several years, perhaps the most direct call to action came in the form of the report from the National Commission on Terrorist Attacks Upon the United States, also known as the 9-11 Commission report. This report called for increased integration of the intelligence community, and increased integration of intelligence—facilitated by increased information sharing. The quest for integration was underway prior to work of the 9-11 Commission, but it was strongly boosted by the release of the commission's report.

Horizontal integration, or HI as it became known, was a noble effort that got bogged down by the sheer enormity of what it was trying to tackle. Given that it was clear that HI efforts would get funded potentially at the expense of other programs, nearly everything became tagged as "HI-related." Horizontal integration became an amorphous unattainable blob of an idea. However, the underlying goal of HI, intelligence integration, did not disappear.

Upon his nomination for the position of director of national intelligence (DNI), Jim Clapper pronounced intelligence integration as just about his sole priority. His first major personnel announcement as DNI was that Robert Cardillo would join his staff as the deputy DNI for intelligence integration, a new position combining the previous deputy positions for intelligence collection and production.

Interestingly, Jim Clapper was previously lauded for his efforts to integrate the disparate intelligence disciplines when he was director of NGA. He understood during that time at NGA that geospatial intelligence was, and continues to be, a natural underpinning for bringing this information together.

Most pieces of information have two critical components associated with them: time and location. GEOINT brings to the equation the location—the "where"—which is key to forging integrated intelligence, and thus our theme for this year.

For years we have used the idea of GEOINT as an organizing principle for thinking about bringing

all the intelligence disciplines together. The idea of forging integrated intelligence is a natural extension of those discussions and efforts. But getting integration right is a huge challenge; if it wasn't, it would already be done. We will make sure to infuse this idea during appropriate points during GEOINT Community Week, and we will focus speakers on it in our other forums.

Looking forward to the fall and GEOINT 2011, I couldn't be more proud of our speaker lineup. We have confirmed the best array of keynote speakers in the history of the symposium: The DNI, under secretary of defense for intelligence, commander of U.S. Cyber Command/director of NSA, commander of U.S. Strategic Command, commander of U.S. Southern Command, commander of U.S. Northern Command, director of the National Reconnaissance Office, director of NGA, and both the chairman and ranking member of the House Permanent Select Committee on Intelligence.

Complementing these keynote speakers will be a superb array of panels and breakout sessions and our unparalleled exhibit hall filled to capacity with programs, solutions and products for the defense, intelligence and homeland security communities. We are looking forward to building on the momentum of last year's fantastic event.

Our efforts this year will surround seeking to enhance national security through fostering discussions on forging integrated intelligence. It's critically important that we get this right, and we at USGIF are eager to do our part. Achieving integrated intelligence, from the data level to the enterprise level, from the individual "INT" level to the policy level, is no trivial task, but it is an imperative. As the proverbial saying goes: "It's hard to roll up your sleeves and get to work if you're busy wringing your hands."

So please join USGIF's efforts this year and let's get to work, Forging Integrated Intelligence!

Sincerely,

Keith J. Masback
President

USGIF Announces Commercial SAR Working Group; Schedules Training Event at PACOM

The USGIF and its members have formed a Commercial SAR Satellite (CSARS) Working Group to explain the capabilities and promote the advantages of space-based SAR as well as to provide hands-on learning and training for users. The group will be discussing its offerings on Thursday, May 12, during GEOINT Community Week's USGIF Technology Day at the Hyatt Regency Reston in Reston, Va. The working group hosts its first training event in June at U.S. Pacific Command (PACOM).

The working group comprises USGIF Members MacDonald Dettwiler and Associates Ltd. (MDA), the commercial provider of RADARSAT-1 data and operator of RADARSAT-2; Infoterra GmbH, the commercial provider of TerraSAR-X and TanDEM-X data; and e-GEOS S.p.A., the commercial provider of COSMO-SkyMed constellation data. These USGIF members came to the foundation with the idea for a working group to further promote the tradecraft and educate the GEOINT Community on the wide range of capabilities SAR provides.

Just this year, Aviation Week's 53rd annual Laureate Awards recognized the Radar Imaging Commercialization Team of Vark Helfritz, managing director, Infoterra GmbH; John Hornsby, president, MDA Geospatial Services Inc.; and Marcello Maranesi, CEO, e-GEOS. Aviation Week's Laureate Awards were conceived more than 50 years ago to recognize the extraordinary achievements of individuals and teams in aerospace, aviation and defense. The three companies were honored for epitomizing the values and visions of the global aerospace industry in the space category, specifically for how they "helped make radar imagery an essential element of geospatial information packages for government, defense and enterprise applications."

Later this year, the USGIF CSARS Working Group will welcome non-commercial satellite SAR organizations to offer their perspectives and join the charter members on the working group.

Young Professionals: USGIF Board of Directors Wants You

At the recent USGIF Board of Directors meeting, the board voted to change the current term of the Young Professional Board Seat from a one-year commitment to a two-year commitment. The board feels strongly the Young Professional seat is vital to the board and USGIF, and thus deserves more than a year to gain experience and make an impact.

With the additional commitment, the board has re-opened the nomination period for applications for the Young Professional Board Seat. The deadline to apply is Friday, June 3. The board will review applications and select a new YP board member during its June meeting. Currently, Mr. Alex Martinez, Lockheed Martin, is fulfilling this position and will continue to do so until next year, along with this newly selected candidate.

The ideal candidate is experienced and well-versed in the geospatial intelligence field. He or she also is familiar with the needs and wants of GEOINT Young Professionals. Candidates must be committed to the Young Professional Group's mission of uniting junior GEOINT professionals within the defense, intelligence and homeland security communities by helping to generate new ideas, programs and events with this in mind. This individual must also be willing to volunteer their time for all YPG events and serve as the co-chair for the bi-monthly YP Working Group Meetings.

The selected candidate must meet the above mentioned qualifications, be no older than 35 years of age or have five or fewer years experience in the industry. Those interested in applying for this position should email ypg@usgif.org for an application or visit http://usgif.org/community/ypg for more information.

Be Recognized for Your GEOINT Contributions: Nominate Now for the USGIF Awards Program

The USGIF Awards Program annually recognizes the exceptional work of the geospatial intelligence tradecraft's brightest minds and best programs. Visit the USGIF website, http://usgif.org, and nominate yourself, a colleague or other admirable organization or program today.

Award recipients are announced during the GEOINT Symposium and recognized on stage during the general session with the one-of-a-kind handmade award. In addition, all team members are presented with a high-quality award packet complete with certificate and photograph to display.

Multiple award categories offer opportunities for everyone within the community. The USGIF Geospatial Intelligence Achievement Award recognizes an individual or team from the military, government and industry; the USGIF Academic Achievement Award commends the accomplishments of a top graduate of an academic program; and the USGIF Academic Research Award applauds an organization or person making tremendous impact in research and or development.

Last year's USGIF Geospatial Intelligence Achievement Awards were presented to Ms. Donna Bridges, Penn State University (Academic Achievement Award); Dr. Dennis J. Bellafiore, senior lecturer, Department of Geography, Penn State University (Academic Research Award); the Department of Homeland Security U.S. Customs and Border Protection Enterprise GIS Team (Intelligence Achievement Award-Government); U.S. Central Command's Human Terrain Analysis Branch (Intelligence Achievement Award-Military); and Mr. Steve Panzer and Mr. David Hemphill of ObjectFX (Intelligence Achievement Award-Industry).

All nominations are due by Friday, August 19, but it is never too early to submit an application. Learn more at http://usgif.org/community/usgifAwards.

USGIF May 13 Analytic Transformation Workshop to Feature DNI's Robert Cardillo, NGA's John Goolgasian and DIA's Ed Mornston

Don't miss this exclusive event to learn from and speak with GEOINT Community leaders on the topic of Analytic Transformation.

As part of the USGIF Workshop Series, on Friday, May 13, USGIF, with sponsors BAE Systems and DigitalGlobe, will host a day-long conversation on this important topic.

The day features keynote addresses from Robert Cardillo, deputy director of national intelligence for intelligence integration, and Ed Mornston, director, Joint Intelligence Task Force-Combating Terrorism, Defense Intelligence Agency.

There will also be five panels covering tradecraft and analytic methods, training and education, enabling technology, and future analysis trends. John Goolgasian, implementation lead for analytic depth, Vision Implementation Team, National Geospatial-Intelligence Agency, will lead attendees through some of the major challenges and opportunities.

Other organizations participating include the Intelligence & Security Academy, Office of the Undersecretary of Defense for Intelligence, Naval Research Laboratory, National Defense Intelligence College, Department of Homeland Security, Defense Advanced Research Projects Agency, U.S. Special Operations Command, Intelligence Advanced Research Projects Activity, Satellite Sentinel Project, IHS Jane's, Towson University, the Senate Select Committee on Intelligence, and others.

The cost of this event is $249 for USGIF members, $349 for non-members, $100 for young professionals, $75 for full-time students and teachers or administrators, and $99 for government employees and active-duty military.

Advance registration is available online at http://usgif.org/events/workshop-series. On-site registration will be available if the event has not sold out by May 13.

[Photos are from previous USGIF events.]

GEOINT 2011 Registration Opens in June

USGIF Freezes Attendee Pricing to 2010 Cost for Early Bird Registration and Reduces Military and Government Registration Fee.

The GEOINT 2011 Symposium opens registration in June, and USGIF is offering 2010 pricing for full-symposium attendees who register during the Early Bird window.

Given budget constraints and economic conditions, USGIF believes it is important to provide industry and organizations the ability to attend and gain the knowledge they need to succeed based on last year's budgets. The limited-time price freeze offers this.

USGIF also has reduced the already low cost for full-symposium government employees and active duty military attendees. This lower price for government and military is locked in for the duration of registration and can be taken advantage of now, after the new fiscal year begins on October 1, or even on-site in San Antonio.

The GEOINT 2011 Symposium, the nation's largest intelligence event of the year, takes place October 16-19 at the Henry B. Gonzalez Convention Center. Last year more than 4,000 total attendees came to GEOINT 2010 to hear speakers discuss multi-INT topics and see the latest technologies from over 220 exhibitors and sponsors in an exhibit hall of more than 100,000 square feet.

The GEOINT 2011 agenda will be available online soon, and USGIF recently announced its confirmed keynote speakers:

- General Keith B. Alexander, U.S. Army, commander, U.S. Cyber Command, and director, National Security Agency
- Mr. Bruce Carlson, director, National Reconnaissance Office
- The Honorable James R. Clapper Jr., director of national intelligence
- General Douglas Fraser, U.S. Air Force, commander, U.S. Southern Command
- General C. Robert "Bob" Kehler, U.S. Air Force, commander, U.S. Strategic Command
- Ms. Letitia A. Long, director, National Geospatial-Intelligence Agency
- U.S. Representative Mike Rogers of Michigan, chairman, House Permanent Select Committee on Intelligence
- U.S. Representative C.A. Dutch Ruppersberger of Maryland, ranking member, House Permanent Select Committee on Intelligence
- Admiral James A. "Sandy" Winnefeld Jr., U.S. Navy, commander, North American Aerospace Defense Command, and commander, U.S. Northern Command
- Michael G. "Mike" Vickers, undersecretary of defense for intelligence.

Video of the keynotes and breakout tracks from the GEOINT 2010 Symposium can be found online at www.geointv.com.

More information about the GEOINT 2011 Symposium is available at www.geoint2011.com. You can also follow the symposium on Twitter @geointsymposium.

There Are NO Dumb Questions

IBM'S INNOVATIVE DEEP QUESTION ANSWERING MACHINE CAN INTEGRATE INTELLIGENCE.
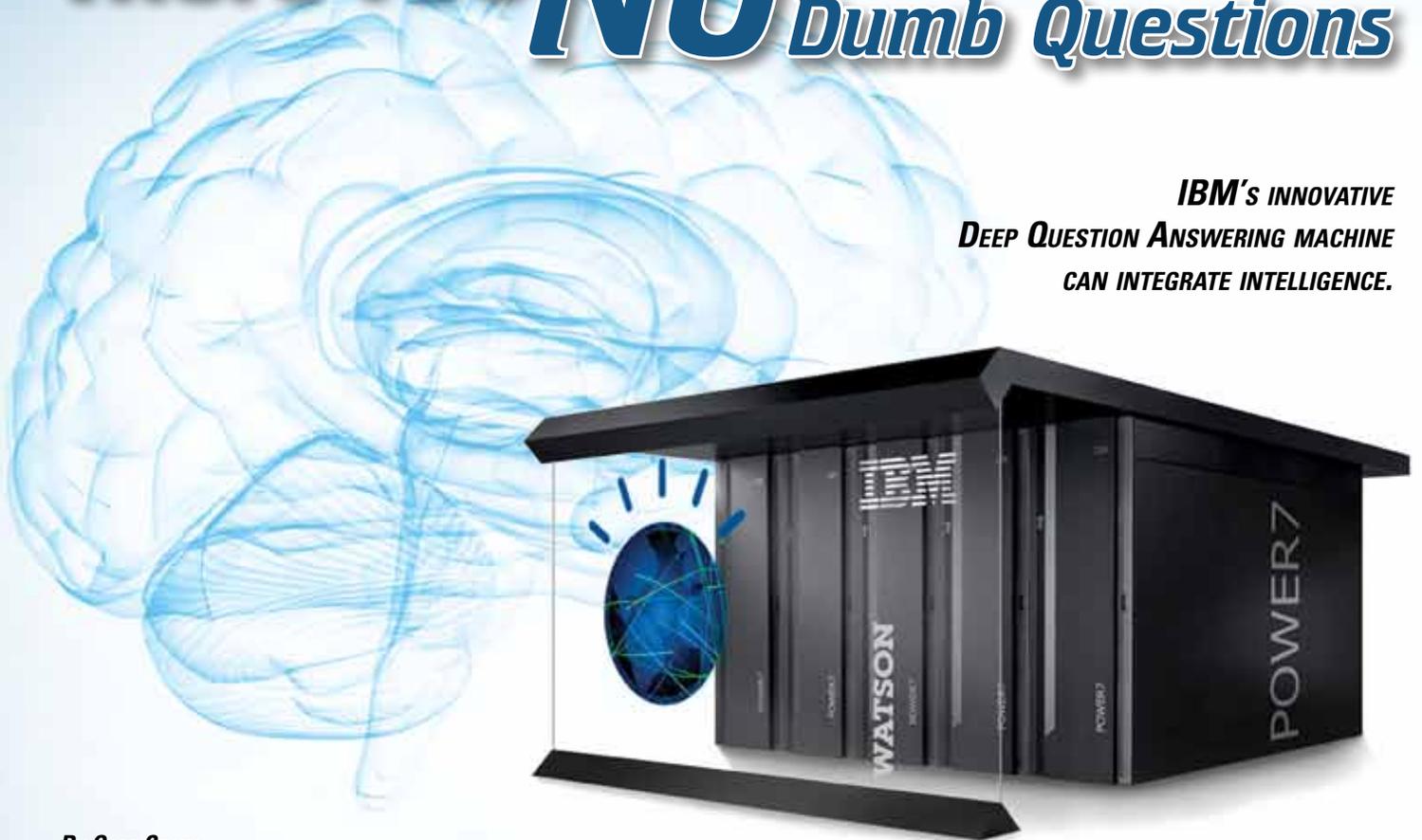
BY GABE CHANG

Using analytics to glean an answer from a myriad of sources, unstructured and structured, vast volumes, and distill that answer is a fairly common intelligence challenge. Now obfuscate the challenge by asking a natural language query in a way that takes open domain sources stored in archives and from discombobulated streams of information to forge integrated intelligence, based on some specific scenarios (for example, *Jeopardy!* gaming rules). Now that is a grand challenge.

The scenarios within which the Question Answering (QA) must occur reveal a demand for risk-reward tradeoffs due to the temporal nature of the user's query. Without shelf-life constraints for the analyst to discover the golden nugget within a matter of minutes, any old machine will do.

In the case of a highly parallelized Watson supercomputer, responses to queries must meet stringent requirements, and a best guess is proffered along with confidence levels with the reasoning to hazard a particular answer. This resultant answer is corroborated or justified by multiple sources, and is an extremely important part of the validation, especially if the penalty for getting it wrong is significant.

The precise determination and confidence of returned queries is what makes IBM Watson so powerful. The next step of innovation, above and beyond a simple web search, is the sleuthing out of intelligence hidden in the data, and it is four areas that encompass the Watson scenarios for proposing a particular answer. That is, deliver:

- **Precise Answers:** Determine what is being asked and give precise responses
- **Accurate Confidences:** Determine likelihood answer is correct
- **Consumable Justifications:** Explain why the answer is right
- **Fast Response Time:** Precision and confidence in less than 3 seconds.

Analytics in the enterprise or agency is about systematic leverage of cross-functional business or mission information and the resulting optimization of mission decisions and processes.

How might an analyst view an open source web search versus what Watson is doing? A web search returns an imprecise ranked list of web pages based upon user keywords. This is actually the initial challenge, often the attempt to choose the right or appropriate keywords.

Watson, on the other hand, formulates an effective query that zeroes in on the relevant documents, which is a critical but non-trivial task. Watson does this by posing the query interpretations and its subsequent associations against its corpus of information while running hundreds of analytics algorithms—in effect relying on the resultant ranking to help determine whether it has indeed asked the right question.

In an era where access to a variety of applications in pick-your-favorite app stores makes it simple to do an answer subset waterfall of information mash-ups, Deep QA is a specific instance of information gathering and triage to enable a purposeful mission decision. Watson takes an entire UIMA architecture and the processing power behind it to uniquely distill a single most likely answer nugget from the pools of available stored data.

Deep QA as applied specifically to the Watson Supercomputer takes any query,

generates and scores hundreds of hypotheses and many thousands of data points to determine the answer with the highest degree of validity. This is done in the natural language semantics of human beings, while applying principles of machine learning and reasoning algorithms.

When IBM Watson competed against two grand champions in *Jeopardy!*, the machine was matched against humans clustered in what is termed "the winner's cloud"—human contestants who solve 85 percent to 95 percent of the clues. This was predicated on the fact that the winners had "buzzed" in first, and these contestants on average hit the buzzer 50 percent of the time faster than their fellow competitors.

The *Jeopardy!* scenario included a broad range of topics from history, literature, sports, pop culture, politics, movies and science. The questions themselves, moreover, may contain subtle clues with added complexity such as irony, puns, riddles and other human language idiosyncrasies. Queries that include disambiguation, unfamiliar syntax, spatially or temporally constrained questions—or simply bad question framing—require a deeper level of information analysis.

Vast digital repositories exist in the open source cloud, and taking advantage of the amount of digitally encoded unstructured information (for example, natural language documents, corporate intranets, reference books, textbooks, technical reports and blogs) can be leveraged by computers to do what was once considered the exclusive domain of human intelligence: rapidly answer and rationalize open-domain natural language questions confidently, quickly and accurately.

In the enterprise environment, mission applications that evolve over time are usually subject to remaining within distinct information silos. Thus, while information sharing has been a challenge, the common Application Service Providers' model has promoted a virtualized adapter method of getting at the data. However, getting at your data within the silos of CRM systems, remote COMs, geographically dispersed NOCs, help desks, web self-service portals, data warehouses, business intelligence modules, TPED systems and so on is then dependent upon running on an optimized platform purpose-built for that type of federated access and query.

The physical architecture of Watson reveals optimization and scaling on about 3,000 Power 7 cores with Hadoop, using
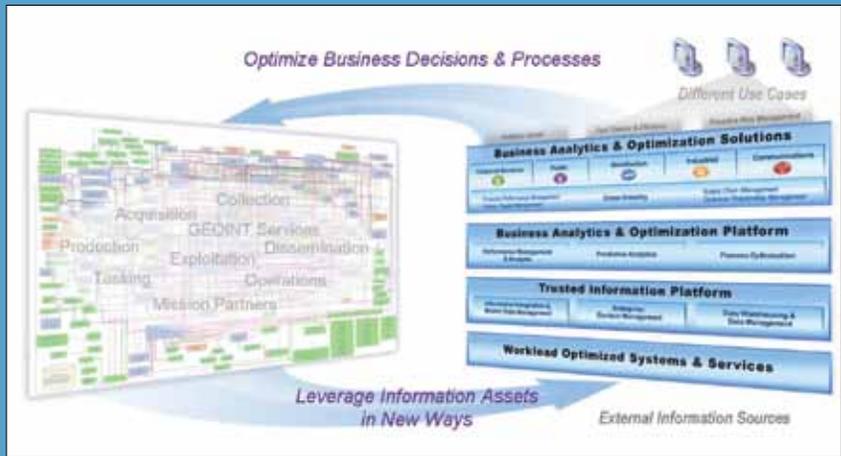
Top: Analytics is about systematic leverage of cross functional business or mission information and the resulting optimization of mission decisions and processes. [Graphic courtesy of IBM]

Bottom: IBM's Watson computer system, powered by IBM POWER7, competes against *Jeopardy!*'s two most successful and celebrated contestants — Ken Jennings and Brad Rutter — in a practice match held during a press conference at IBM's Watson Research Center in Yorktown Heights, N.Y. on January 13, 2011. Watson competed against Jennings and Rutter in the first-ever man vs. machine *Jeopardy!* competition, which aired on February 14, 15 and 16, 2011, with two matches being played over three consecutive days.

more than 100 different algorithms on a UIMA-AS architecture. For *Jeopardy!* queries, a single question on a 2.6 GHz core can take over two hours to process. IBM Watson is a workload-optimized system to handle the massive analytics at rapid speeds required to analyze complex language and deliver correct responses to natural language clues.

As this issue was going to press, IBM Watson had competed in a number of events, with refinements made after each competition. With analytics becoming prevalent across all facets of industry and government, the explosion in analytics value has prompted IBM to create six Business Analytics and Optimization (BAO) centers, proffer domain specific hardware, software and research solutions, and execute with more than 4,000 dedicated BAO consultants as of 2010.

During the recent competitions, Watson demonstrated the capability to deliver precise, meaningful responses, and synthesize, integrate and rapidly reason over the breadth of domain knowledge as it is most rapidly and naturally produced—in natural language text. ✶

Gabe Chang is a co-chair of the U.S. Geospatial Intelligence Foundation Emerging Technologies Subcommittee and frequent contributor to GIF, *and serves as a senior client IT architect for IBM. For more information on IBM Watson, visit www.ibm.com/watson. Please make sure you frame your query in the form of a question.*

Contact Editor Harrison Donnelly at harrisond@kmimediagroup.com. For more information related to this subject, search our archives at www.GIF-kmi.com.

Technology
Enhances
the View

NGA AGREEMENT WITH SATELLITE IMAGERY PROVIDERS WILL YIELD HIGHER QUALITY DATA NEEDED TO MEET INCREASING MISSION REQUIREMENTS.

By Karen E. Thuermer
GIF Correspondent
thuermerk@kmimediagroup.com

The National Geospatial-Intelligence Agency's EnhancedView program is headed for space with the latest satellite, imaging and other technologies designed to provide the best overhead imagery available to support a wide range of government missions.

Seeking commercial imagery with ground resolution as fine as a quarter-meter, NGA last year contracted with the nation's major satellite imagery providers, DigitalGlobe and GeoEye, to help meet the increasing geospatial intelligence needs of the intelligence community and Department of Defense.

The contracts—$3.5 billion for DigitalGlobe and $3.8 billion for GeoEye—fall under NGA's new EnhancedView program, which builds on, and eventually will replace, the current NextView program. Under the contracts, the companies are incentivized to build the new satellites and launch them into orbit as soon as possible while managing their risk.

While its purchasing deals are structured like those under NextView, the EnhancedView program will yield higher quality data needed to meet increasing requirements to support various U.S. government missions. Those include humanitarian relief, disaster relief, support for U.S. forces deployed around the world and intelligence issues NGA is following.

"We want more imagery; we want it faster, and we want better resolution and quality levels," stated Scot Currie, director of commercial space and airborne programs for NGA.

Like NextView, the EnhancedView contracts give NGA the vehicle to buy off-the-shelf satellite imagery from contract award winners GeoEye and DigitalGlobe by engaging these companies to build satellites that provide increased volumes of imagery, improved resolutions, improved timeliness of delivery back to the government, and assured satellite access and data delivery to government customers. Instead of developing, launching and managing satellites and other infrastructure on its own, the NGA can save time and money by working with DigitalGlobe and GeoEye.

The benefit, said Jeff Kerridge, senior vice president and general manager, Defense and Intelligence Business Unit, DigitalGlobe, is that "NGA can access the largest image library of constantly refreshed imagery of the world and, in times of crisis or political unrest, benefit from near real-time access to imagery and information from our full range of our satellites covering the world. In addition, NGA can benefit from a rich set of products based on our imagery, including monitoring and other services."

The goal is to provide NGA with timely data collection, multi-source production and hosting services for immediate response, maintenance and monitoring while simultaneously incorporating evolving standards and information security requirements. In addition, because of NGA's commitment to innovation, "We are building on our expertise in managing geospatial intelligence," commented GeoEye Chief Operating Officer Bill Schuster. "In effect, we're delivering 'insight on demand.' We're shaping the future by helping the GEOINT community manage and serve huge amounts of data."

In the end, both government and commercial customers benefit, particularly since these companies can spread costs over multiple customers and, therefore, operate more efficiently. In fact, the program's genesis came from U.S. commercial imaging companies needing a big customer and the U.S. government realizing that private industry could provide high-quality imaging as a service without the bureaucracy and overhead of a project it would build from scratch.

"Because we have already made the cost-share award under NextView, the idea of the concept is that the satellite manufacturers would be financially healthy enough to maintain their business practice and replenish those satellites without additional government investment," Currie explained.

Prior to the program, the manufacturers planned to build satellites using their own financial resources.
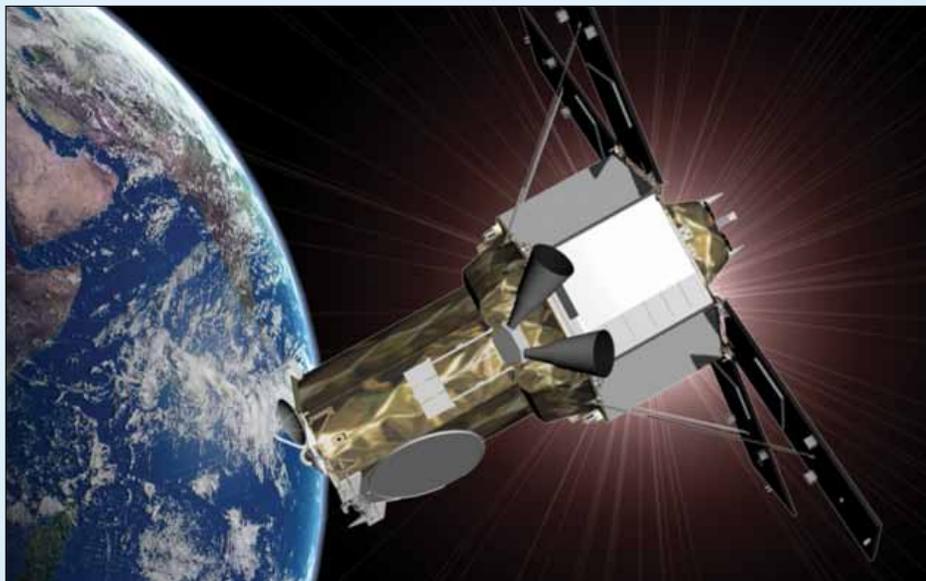
GeoEye-2 will be capable of supporting a variety of missions for the U.S. government and for the commercial market.
[Image courtesy of GeoEye]

"They were launching satellites out in the 2017 time frame," Currie commented. "The government desired to have that capacity sooner, so our investment accelerated the build out of those satellites to something closer to 2013-2014."

Imaging Technology

Timeliness and high resolution of information are NGA's most critical requirements. But there are limits on licenses and what kind of resolution the commercial imaging companies can sell outside the government program. For that reason, NGA is sensitive about how it works with GeoEye and DigitalGlobe.

"If we drive them to a certain resolution, then they cannot resell it commercially," Currie said.

Consequently, NGA is not trying to push technology, but to maximize the existing technology that was on orbit during NextView. "We let the vendor decide what altitude to choose, and what aperture satellite to build to satisfy our requirements," Currie said.

Per the EnhancedView agreement, DigitalGlobe is to supply satellite imagery deliveries from WorldView satellite constellation under a service level agreement, and to immediately begin procurement and construction of its next satellite, WorldView-3, which the company expects to be ready for launch by the end of 2014.

Many different contractors and subcontractors will be working on WorldView-3, but only Ball Aerospace & Technologies, for the satellite, and ITT, for the camera, have been contracted and named to date, Kerridge revealed.

The WorldView-3 satellite is the fourth satellite Ball has built for DigitalGlobe's remote sensing satellite constellation.

Under the contract for WorldView-3, Ball Aerospace will provide its Ball Commercial Platform (BCP) 5000 spacecraft bus and integrate the remote sensing instrument onto the bus as well as test the entire system.

"The BCP 5000 accommodates next-generation optical and synthetic aperture radar remote sensing payloads, and is designed to be a flexible, stable and highly accurate Earth remote sensing platform," reported Jeff Dierks, Ball program manager. "The BCP is a family of spacecraft designed for cost-effective remote sensing applications. Ball's BCP can be built in as little as 24 months."

The advanced Control Moment Gyroscopes, provided by Ball Aerospace for WorldView-3 and previously for WorldView-2, afford the satellites the flexibility to capture more imagery than ever before. WorldView-2 has the highest data gathering capability of any spacecraft commercially available.

In addition, Ball Aerospace's engineers developed a new instrument vibration isolation system for WorldView-2, also to be used on WorldView-3, to control jitter induced by the spacecraft.

Jeff Kerridge

Bill Schuster

Jeff Dierks

Rob Mitrevski

The spacecraft also supports direct tasking, which allows select DigitalGlobe customers around the world to load imaging profiles directly up to the spacecraft and execute delivery of the data directly down to their own ground stations.

Ball Aerospace applies some of the capabilities of classified spacecraft systems to its commercial imagery projects for the WorldView satellites, resulting in cost savings, risk reduction and faster delivery for its customers.

Under EnhancedView, ITT Geospatial Systems has been selected to build imaging payloads for both GeoEye-2 and WorldView-3 satellites.

ITT completed a successful preliminary design review for the WorldView-3 instrument in December 2010, and a successful critical design review for the WorldView-3 power supply unit in January 2011. Work has been progressing per plan on long lead optics and electronics assemblies, and ITT was expected soon to finalize the upcoming critical design review for the WorldView-3 instrument.

"The imaging payloads that ITT is currently building have a number of improvements compared to past systems," said Rob Mitrevski, vice president and general manager, ISR, for ITT Geospatial Systems. "For example, increased capability is being incorporated into the EnhancedView program with higher ground resolution, increased area coverage and improved signal-to-noise ratio."

ITT was also contracted by GeoEye in October 2007 to begin work on the camera and camera electronics for GeoEye-2.

"The sensor is one of the most important components of GeoEye-2," reported Schuster.

Recently, ITT satisfied a key milestone with the successful completion of the critical design review for the GeoEye-2 imaging system.

"ITT now looks forward to moving into the next phase of integration and testing activities for the GeoEye-2 payload, and anticipates delivering the imaging system to Lockheed Martin, prime contractor for the GeoEye-2 program, in early 2012," Mitrevski said.

ITT has also successfully completed critical design review for the WorldView-3 imaging system.

Satellite Payload

For GeoEye-2, ITT is on contract to Lockheed Martin Space Systems, which is providing the GeoEye-2 spacecraft and associated command and control system to GeoEye. For WorldView-3, ITT is on contract with DigitalGlobe, which will be providing its imaging payload to Ball Aerospace & Technologies Corp. for integration into the satellite.

ITT's imaging systems consist of an optical telescope and sensor subsystem, including the focal plane assembly, the data processing unit for onboard image data compression and power supply.

"These systems provide the highest resolution imagery commercially available and unparalleled image quality, built in such a way
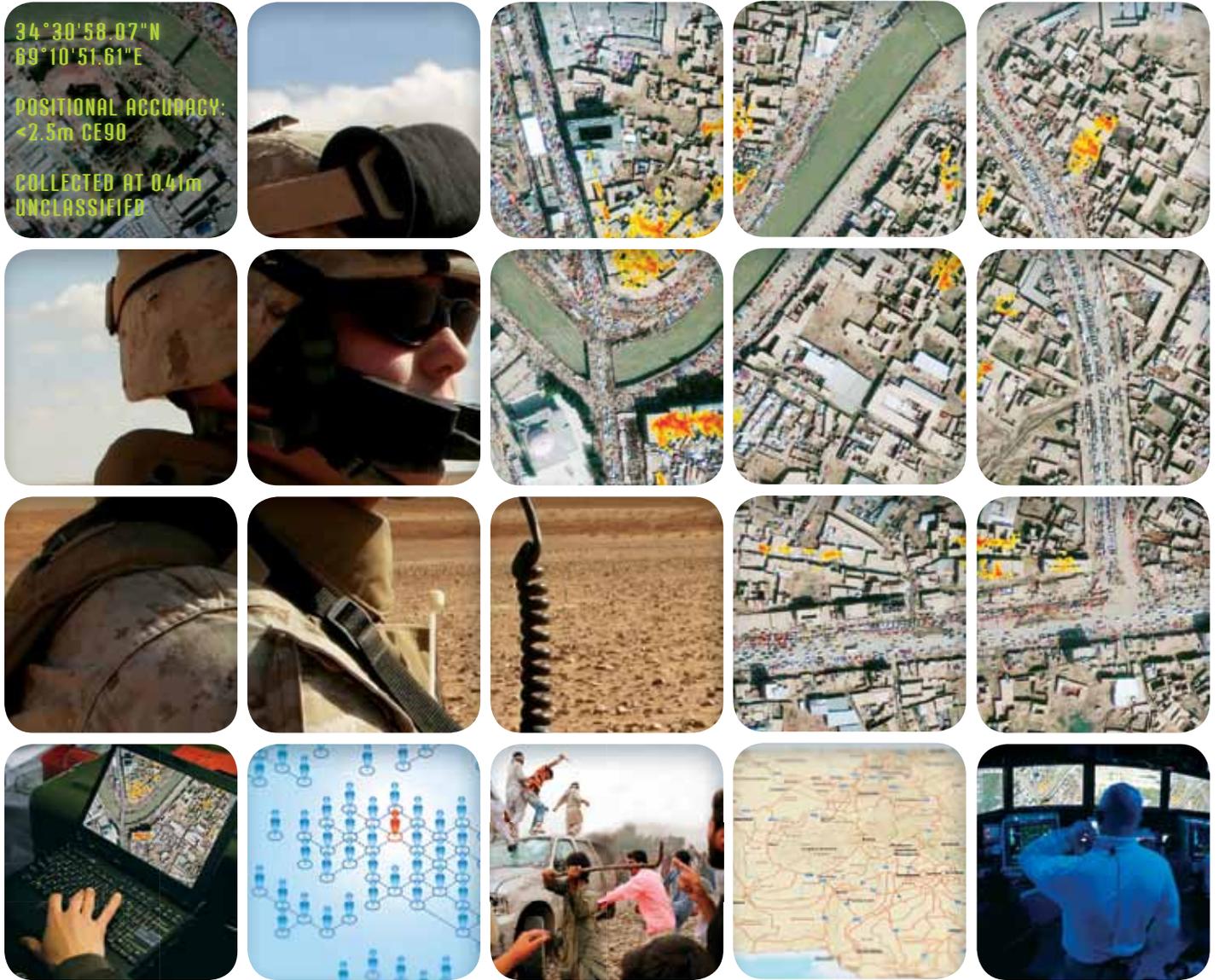
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that supports our customers' geolocation accuracy," Mitrevski said. The imagery produced by ITT's imaging payloads has a variety of purposes, both civilian and military.

Under EnhancedView, NGA will purchase GeoEye's existing satellite constellation under an SLA and commercial imagery when GeoEye-2 becomes operational in 2013.

Schuster maintained that the EnhancedView contract has allowed GeoEye to accelerate its development of the GeoEye-2 satellite so that it is operational in 2013. Once operational, the satellite will deliver 33-centimeter resolution.

"In addition, the satellite will have significant improvements in performance capabilities, such as enhanced tasking and the ability to collect more imagery at a faster rate," Schuster said. "GeoEye-2 will be extremely capable to support a variety of missions for the U.S. government and for the commercial marketplace."

GeoEye selected Lockheed Martin Space Systems to build GeoEye-2 last year.

"Our decision to select Lockheed Martin for our third-generation imaging satellite was based on the extremely challenging performance requirements we've specified for GeoEye-2," commented Schuster. "Lockheed Martin also brings a 50-year heritage of design, development and operational expertise in providing the most advanced satellite systems for government and global commercial customers worldwide such as IKONOS and, more recently, NASA's Mars Reconnaissance Orbiter."

Allen Anderson

The Lockheed Martin team is progressing on schedule in support of GeoEye-2's scheduled launch and on-orbit operations in early 2013.

"The team successfully completed the system's preliminary design review in November 2010, validating the spacecraft's design maturity, meeting or exceeding all GeoEye standards and requirements," reported Allen Anderson, GeoEye-2 program director for Lockheed Martin Space Systems. "The team is currently advancing toward the program's next milestone, the critical design review, which is slated for mid-2011."

Lockheed Martin is providing a full systems solution for GeoEye-2, designing, developing and delivering the satellite and the associate command and control systems. Lockheed Martin Space Systems is developing the satellite structure and components, while Lockheed Martin Information Systems & Global Solutions is designing the ground control systems, and Lockheed Martin Commercial Launch Services is providing the Atlas V launch vehicle.

Lockheed Martin is working in concert with the satellite's payload provider, ITT Geospatial Systems, which is developing the optical camera that will produce images in four multispectral bands and at a ground resolution of 0.33 meters at nadir (with 652 km orbit).

In addition to GeoEye-2, money is allocated for value-added products and services to include the design and procurement of additional infrastructure related to GeoEye's eyeQ Web Mapping Services, which will be delivered under the SLA.

A Web services offering, eyeQ provides the core infrastructure for GeoEye's new geospatial information services business. EyeQ

commenced operations in April 2010 with support to the NGA and commercial customers.

TIMELY ADVANCEMENTS

Over the last decade, the commercial satellite industry has made significant advancements to satellite imaging.

DigitalGlobe secured the first license allowing a private enterprise to build and operate a satellite system to gather high-resolution digital imagery of Earth for commercial sale. Thereby, the company successfully launched what was then the world's highest-resolution commercial satellite, QuickBird.

"We created the most agile satellites in the world, using Controlled Moment Gyros on all of them to acquire a maximum area of imagery in a single overhead pass," Kerridge described. "We were the first to offer change monitoring products, which allowed customers like NGA to make more focused and informed decisions."

DigitalGlobe was also the first company to deliver 3-D capabilities and enhanced Web services, providing even richer imagery faster to customers.

"More recently, we have created unique 8-band capabilities, which helps us to collect more data from images, automatically extract more information from them and deliver deeper insight to customers," he added. "And in the last quarter we have developed unique monitoring apps for the iPhone and iPad."

GeoEye owns and operates two high-resolution Earth-imaging satellites, GeoEye-1 and IKONOS, and two airplanes with advanced high-resolution imagery collection capabilities.

"GeoEye-1 is the world's highest resolution and most accurate commercial Earth-imaging satellite," Schuster said.

In addition to GeoEye's imagery collection capacities, the company is a global leader in the creation of enhanced satellite imagery information products and services.

"We operate several state-of-the-art high-resolution image processing and production facilities," he added.

GeoEye's ground terminal network and ground systems for command and control, mission planning, production and hosting services are all configured to provide seamless and timely interaction with NGA's systems.

In addition, GeoEye's St. Louis, Mo., production services group has been supporting the NGA for 23 years and is capable of merging and processing multiple sources of data from a wide range of government and commercial source into a single, precise and seamless value-added product.

"The company introduced this capability to the NGA in 2004, and since then we have made a significant investment in expanding our geospatial production based on NGA's requirements and improving our throughput and timelines," Schuster said.

For example, the company has streamlined and automated orthoimagery production processes that can now support high-resolution imagery foundation-based operations products and their maintenance to meet current objectives as set forth by NGA and the National System for Geospatial Intelligence. ✪

Geospatial Intelligence Forum

Cover and In-Depth Interview with:

Barry Barlow

**Director,
Acquisition Directorate
National Geospatial-
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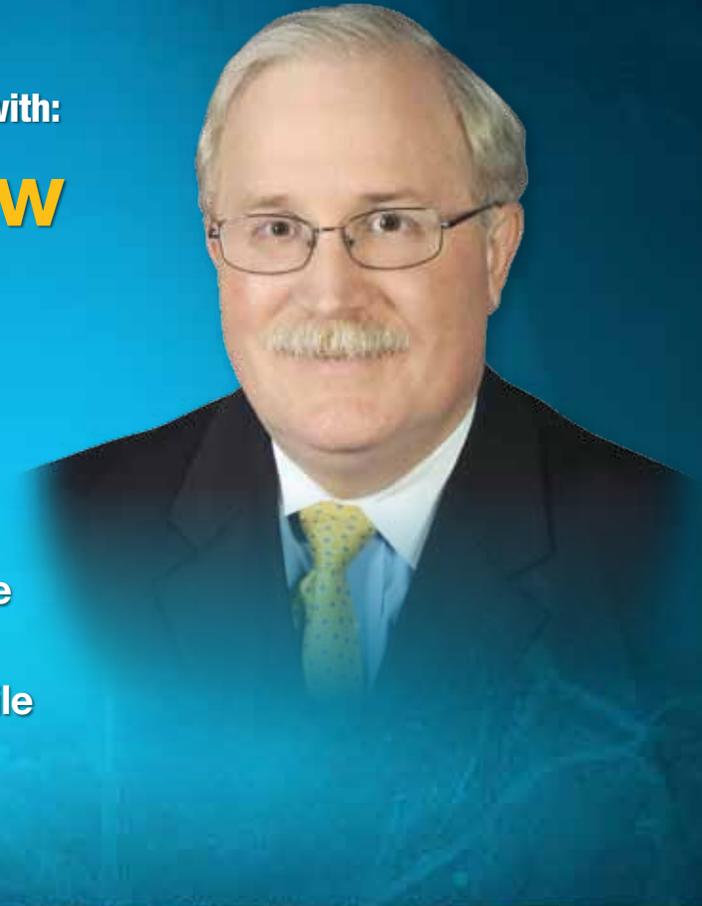
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Insertion Order Deadline: June 17, 2011
Ad Materials Deadline: June 24, 2011

Full Motion Video Team to Promote Development of Advanced ISR

Harris has combined its commercial and government full motion video initiatives into a single organization focused entirely on supporting the ISR market for full motion video (FMV) products and systems. The Harris full motion video team will focus on government customers' needs, promote the rapid development of more advanced ISR capabilities and accelerate the deployment of these solutions to assist analysts in the field to manage the massive amounts of sensor intelligence data being collected.
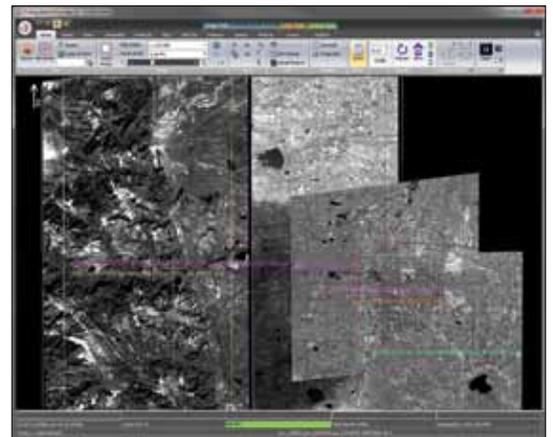
The new Harris FMV organization will support all U.S. government, international military and federal law enforcement activities for the Harris Full Motion Video Asset Management Engine (FAME) architecture and related technologies and capabilities from across Harris. FAME is a collaborative platform that provides video, audio and metadata coding, video analytics, and archive capabilities—all within a unified digital asset management solution. Using the FAME architecture, Harris has developed additional features to provide intelligence analysts and warfighters with better access to higher-resolution full motion video, motion imagery and visual imagery. Primary potential customers include branches of the military, federal law enforcement agencies and other defense companies who serve as prime contractors on large systems. In addition to supporting end-user requirements, the new organization will target major prime contractors and offer advanced ISR solutions that reduce their time-to-market for large government program systems.

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Software Enhancements Aid High-Resolution Imagery Imports

BAE Systems has added new capabilities to its GEOINT software, providing enhancements that allow customers to import high-resolution imagery from scanned film and digital airborne sensors. The company's SOCET GXP software automates image processing to make analysts more responsive in the operational environment. Film and digital airborne sensors are the primary data sources for many geospatial analysts, particularly in commercial and global markets where acquiring satellite imagery is often not feasible. BAE Systems developed a step-by-step wizard interface to simplify the frame import process, reducing the time required for image processing. Advanced image processing algorithms assist operators with change detection, image classification, identifying anomalies and tracking patterns of activity over time. The SOCET GXP v3.2 software release also adds automated tools for viewing and editing live video feeds, and efficient tools for converting terrain analysis results from raster to vector file format. Furthermore, hyperspectral and multispectral image processing is extended with the capacity to analyze additional bands of image data, which minimizes the dependency on specialized software packages. Using these tools, analysts can more precisely identify ground features, such as distinguishing between camouflaged fatigues and trees.

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Enhanced Compression Wavelet Enables Fast Decompression

ERDAS has introduced the all-new ECW for ArcGIS Server, which provides a means for ArcGIS Server 10 to deliver Enhanced Compression Wavelet (ECW) data to clients via OGC-compliant Web Coverage Service and Web Map Service. Using components of the ERDAS ECW/JP2 SDK version 4.2, ECW for ArcGIS Server enables ArcGIS Server to support ECW imagery, providing the fastest decompression available. Using minimal memory, ECW can quickly decompress and open massive files, in many cases faster than uncompressed imagery can be opened. Additionally, multi-resolution level of detail is built into the file, eliminating the need to generate or distribute pyramids or overviews. The ECW technique does not require that immediate tiles be calculated and stored on disk; they are an inherent part of ECW's discrete wavelet transformations. ECW also supports opacity channels, allowing images to overlay other imagery cleanly without showing compression artifacts around the edges. ECW for ArcGIS Server may be installed on a single ArcGIS Server, with or without other ERDAS software installed. However, ECW for ArcGIS Server does require a FlexNet license file from ERDAS. This new product expands the industrywide level of support for the ECW format. ECW is already supported in traditional desktop GIS, CAD and remote sensing packages such as ArcGIS, AutoCAD, ERDAS Imagine, ERDAS ER Mapper, FalconView, Bentley Microstation, ENVI and PCI Geomatica.
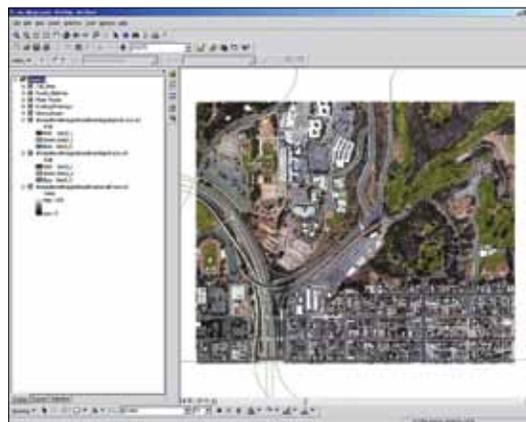
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Defense/Intelligence Firm Gains IT Service Management Certification

TASC, a provider of advanced systems engineering, integration and decision-support services across the intelligence, defense, homeland security and federal markets, has earned the highly regarded ISO/IEC 20000 certification, the first global standard specifically aimed at IT service management. The standard provides proof of excellence and best practice in IT management. According to company officials, implementation of the ISO-IEC 20000 standard will improve efficiency and reduce costs while demonstrating TASC's commitment to quality and continuous improvement. Companies achieve ISO/IEC 20000 certification by exhibiting excellence and proving best practice in IT management. Established in 2005, the standard ensures companies can reach evidence-based benchmarks to continuously improve their delivery of IT services.

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New Blades and Servers Manage the Most Demanding Applications

IBM has announced new workload-optimized Power7 systems, including a performance boost to the Power 750, the same server used in the *Jeopardy!*-winning Watson computer system, that provides even faster processing capability than each machine used in the Watson computer. The new Power blades and upgraded Power servers are built to manage the world's most demanding emerging applications. The specialized demands of these new applications rely on processing an enormous number of concurrent transactions and data while analyzing that information in real time. In addition, the new Power7 systems can provide clients with very high levels of server virtualization and consolidation, which can lead to improved price performance, improved energy efficiency and reduced footprint size in the data center. IBM also introduced a new Systems Director Management Console appliance that allows data center administrators to operate both Power servers and blades with a unified, intuitive interface for physical and virtualized system resource management.

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NGA to Install COTS Collection Planning Software

Orbit Logic has signed a Cooperative Research and Development Agreement (CRADA) with the National Geospatial-Intelligence Agency. Under this CRADA, Orbit Logic will work with NGA to find ways to enhance and apply Orbit Logic's COTS planning software to advance NGA's mission. Already proven over several years of commercial imaging satellite operations, Orbit Logic's COTS collection planning software will be installed at NGA facilities and configured to support multi-satellite collaborative planning. NGA will provide evaluations and feedback on the use of this software and its integration into the NGA process flow. Orbit Logic will also provide demonstrations and workshops on its collection planning software and its Collection Feasibility Tool and UAV Planner software products to NGA employees and contractors under the CRADA contract.

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GeoEye and Esri Launch Imagery Alliance

GeoEye has announced that Esri has signed a strategic contract to license a large amount of GeoEye's high-resolution IKONOS archive imagery. Esri will blend this highly accurate imagery with its current imagery data from multiple sensors to produce a global, static cache map layer. This imagery base layer will be displayed and served to Esri users via arcgis.com, an online system for working with geographic information through a range of GIS desktops, web browsers and mobile devices. Esri will begin building this imagery base layer within the next few weeks and expects to complete it in early 2012. Esri and GeoEye are working together to make GeoEye's imagery archive more accessible to Esri ArcGIS users. In addition, improved search and discovery of GeoEye's content will provide Esri users with a fuller, richer user experience. This foundation marks the beginning of a new direction in the partnership, as it will bring new solutions to both ArcGIS and GeoEye imagery users. The two companies plan to announce joint offerings and other initiatives later in the year.

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Server-Side Software Solution Provides Video Storage, Retrieval Tools

2d3 Sensing, a provider of vision science solutions for industrial, defense and entertainment applications, has released Catalina, a server-side software solution that provides video storage and retrieval tools along with remote access and on-the-fly streaming to enhancement and exploitation tools such as 2d3 TacitView via a centralized server. Catalina is the bridge between sensor and analyst. No matter where collection assets are deployed, Catalina provides core capabilities that will project motion imagery and related metadata into the eyes of decision makers. Key features include capture and storage, with Catalina reaching out to the sensor edge so that any video stream can be digitized and securely stored. Frame accurate search tools allow all users get to exactly the information needed without needing to screen hours of tape. In addition, by leveraging 2d3's TacitView Suite for server and client-side image processing, enhancement and exploitation tools will be accessible from any computer or viewing device on the network.

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Dr. Joseph F. Fontanella
Director, U.S. Army Geospatial Center
Army Geospatial Information Officer
Army Corps of Engineers

Dr. Joseph F. Fontanella was selected to the Senior Executive Service in January 2011 to serve as director of the Army Geospatial Center [AGC]. The AGC is the Army's knowledge center for geospatial expertise and provides geospatial information reachback capability to field units.

As director, Fontanella is responsible for supporting the operations, intelligence, acquisition, research and development, and modeling and simulation communities with geospatial information. The center focuses on the development, exploitation, production and distribution of topographic, geodetic and geospatial information tools and services for the Army and other Department of Defense and national programs.

The center has forward-deployed and reachback elements conducting the collection, dissemination and analysis of geospatial data supporting units in contact. It also provides direct acquisition support to multiple program executive officers and program managers involved in national and tactical programs, and conducts research into geospatial data management, information constructs, data generation, enterprise technology, applications and sensors.

Fontanella also serves as the Army's geospatial information officer, with responsibility for collecting and validating geospatial requirements, formulating geospatial policy, setting priorities and securing resources supporting the Army geospatial enterprise, and synchronizing geospatial solutions at both HQDA and Secretariat levels of Army governance.

From 2006 until his appointment as director, Fontanella served as deputy director of the AGC. From 2004 to 2006, he was assistant director for plans and program management, Engineer Research and Development Center, Army Corps of Engineers. He retired from the Army at the rank of colonel in 2004, after service that included serving in 2003 as assistant chief of staff, engineer [C-7][Fwd], 3d U.S. Army and Coalition Forces Land Component Command, Operation Iraqi Freedom.

Q: What are your priorities as the AGC's newest director and Army geospatial information officer [GIO]?

A: My ultimate goal as director of the AGC is to provide enhanced value to our soldiers, strategic partners and others who rely upon the AGC's ability to deliver timely, accurate and actionable geospatial information and services. We are orienting our focus on three tenets in order to accomplish this goal; the first is adhering to the Army Corps of Engineers motto—"be ready, relevant, reliable, and responsible." We want to build upon our successes within the geospatial intelligence community as a reliable source of high-fidelity geospatial

data. Second, we will remain relevant to the Department of Defense by making certain that the ongoing operational functions we perform are closely tied to our mission. Finally, we need to ensure that we are tied to the future. By wrapping those things together, we address the myriad of needs that our warfighters must have addressed.

The AGC will continue to help "build out" the Army Geospatial Enterprise [AGE], which comprises the people, organizations and technology involved in the acquisition, production, analysis, exchange and use of geospatial data, information and services that affect the Army mission. At its core, the AGE is a distributed database and analytic support structure, based upon a common suite of interoperable software, open standards, data formats and data models, that when integrated in a service-oriented architecture allows geospatial data and information to be collected, stored, managed, fused, analyzed and disseminated horizontally and vertically—for example, from peer to peer and from echelon to echelon and down to the individual soldier. Through the AGE, warfighters will be able to exploit a net-centric, enterprise environment that allows geospatial information to be collected once, then processed, exploited and shared among all soldiers and their organizations in a timely manner. That will reduce redundancy, conserve scarce resources and personnel, and in the end improve the probability of mission success.

My role as the Army's GIO is to be a very effective advocate for the geospatial enterprise across the Army at all levels by serving as the Army's central manager responsible for coordinating, assessing and synchronizing all Army policies, standards and requirements for the enterprise. The GIO reports directly to the Army Geospatial-Enterprise Governance Board [GGB], which comprises high-ranking general officers, each of whom is responsible for specific functional interests within the Army. Together, the Army GIO and the GGB will unify Army GI&S activities by establishing cohesive policies and protocols, enforcing standards, coordinating requirements and ensuring synchronization of actions.

Q: How do strategic partnerships with other GIS-oriented agencies benefit the Army, the AGC and its customers?

A: One of the things I'm working towards right now is connecting with partners and stakeholders. These are folks we have had relationships with in the past, and need to re-solidify. Also, because we operate within DoD, there are always names changing across the spectrum. As new people come into positions of leadership across that spectrum of partners—industry partners, stakeholders and customers—you need to go back out and spend time with them. My time is spent reintroducing myself to this community and becoming better acquainted with the AGC's operations from my optic as the new director.

As deputy, I spent a lot of time working on the functional aspects of the organization. Now the focus is a little bit different. As director, I am spending time with my teammates here to reshape what we are doing to meet the goals and objectives set forth to accomplish our mission.

We need partners in this business. We are a small agency and do a lot using very few resources. So we really have to focus on developing partnerships with others, narrowing in on customers' requirements and making sure we fully understand them. At the same time, it is our responsibility to understand our customers' processes, their capabilities and their requirements to the fullest extent possible. Doing so allows the AGC to use its small cadre of subject-matter experts appropriately to bridge the gaps where our customers most need our support, including better comprehension of geospatial technologies, engineering principles, data availability and analytics, information architecture, training and visualization. The net effect is that our customers are better educated by us in confusing and complex geospatial issues, therefore enabling us to work with them more effectively by accurately refining their requirements as well as servicing their needs.

You have to take it to next level by developing "forcing functions" to ensure you agree on a way ahead; you must have a shared vision of what you want to be doing together. Then you can set up realistic goals and objectives with milestones to move forward on those things. I am trying to bridge the gap between developing and executing strategies, and realizing an outcome that is mutually beneficial to all parties involved.

Q: What are some of the data collection, exploitation and dissemination challenges facing the warfighter?

A: We're facing considerable challenges at the tactical level, but have measures in place to address them. Given the complexity and sensitivity of our current operating environments, the Army's ability to exploit timely, accurate, high resolution and actionable geospatial information is more important than ever. Today a brigade combat team commander has a multitude of battle command platforms and information systems. Unfortunately, these platforms and information systems don't often allow easy information sharing and analysis. Over the course of Operation Iraqi Freedom and Operation Enduring Freedom, the tools and quick response capabilities to help our soldiers evolved rapidly, but little has been done to integrate the technologies and various databases for the commander. In essence, commanders are drowning in data—they have never had so much information at their disposal—and, at the same time, we have never had a greater need for better information management. That is a sizeable challenge.

It's not just geospatial information, but also supporting technologies that pose a challenge to the way we convert data to actionable information. The ways in which we exploit data are undergoing a revolutionary change. There is a new application, a new thought—every day. Look at what happened in Egypt and the Middle East. Things we saw as perhaps social networks are really much more than that now. They are weapons. They are means of communications. They are ways of instigating change. We have to be more sensitive and situationally aware of these tools.

The Army is working to overcome the tactical challenges posed by the overabundance of systems, software and data available to commanders and their subordinates. The more data we collect, the more data they have to process.

Newsweek published an article on "brain freeze" a few months ago. It begs the question, "Have we too much data to make decisions?" So, you have to be able to bend that data in ways that make it digestible, understandable and useful to commanders, given the complexity and sensitivity of their current operating environments. The Army must be able to exploit timely, accurate, high-resolution and actionable geospatial information; that has become more important than ever.

Q: What must the geospatial community do to address these challenges?

A: We need to standardize the means of collecting, processing, exploiting and sharing data. These things have to be developed and set upon before we can truly benefit from all of the information these sources provide.

If we can't convert the data into actionable information, then it is either just noise and can become a distraction, or it could be some pretty important data that is just being missed. Commanders need this important information to complete their missions.

The Army recognized the challenges inherent in the collection of data from the multitude of these geospatial systems and their overall impact on the warfighter. So, the focus we took was to develop an enterprise that had to be tied to the larger Army enterprise. It is still in the process of being built. The ultimate goal of this network is to enable Army GI&S information to be posted, processed and used as necessary. It can also be shared from peer-to-peer, echelon-to-echelon, vertically and horizontally, from the individual soldier up to the national level, and back down in the other direction.

An important goal of the AGE is to create commonality of data, applications and services to the greatest extent possible—the "sharable geospatial foundation." At the same time, we do not want to be so restrictive as to interfere with the ability of systems to carry out their

mission in the most efficient way possible. In order to provide the necessary flexibility, standards are set for individual computing environments, rather than across the board. The resulting minimum set of standards for the given computing environment advances the AGE while giving developers the flexibility needed to implement required capabilities.

Q: How is the AGC contributing to the Army's development, socialization and enforcement of the standardized collection and dissemination of geospatial information?

A: The center's programs and expertise are helping to build the standardized, shareable geospatial foundation required to generate the common operating picture soldier's need to plan contingency, crisis response and humanitarian missions here and abroad. The development of interoperable data and systems requires a concerted, cooperative effort by strategic partners, soldiers and industry—a "given" considering the plethora of programs, platforms and other geospatial technology available to DoD today.

These operations must also be orchestrated within capability set development in order to allow the Army to incrementally field fully integrated command and control tools, which support mission command while maintaining backward and forward compatibility with network operations and other war fighting functions. For example, Army Mission Command, which consists of operations, intelligence, mission rehearsal and training capabilities, all depend on a standard and shareable geospatial foundation achieved through the AGE, and is critical to LandWarNet capability sets that support the fielding of geospatially interoperable Army programs of record [PORs] and non-PORs.

The AGC's Geospatial Acquisition Support Directorate [GASD] is also contributing to the development of the AGE by building the Army Geospatial Data Model [AGDM]. The Army is moving towards a joint, interagency, intergovernmental and multinational environment. The use of coalition forces emphasizes and elevates the need for enterprise operations that can share information across all echelons. The second iteration of this AGDM contains the common geospatial concepts required to share data and support common geospatial applications and services across the AGE.

The directorate has also been working with program executive officers and program managers to develop realistic, achievable and integrated AGE implementation plans, and is supporting them in identifying efficient methods of implementing the AGE. The team's staff is conducting initial system assessments to guide this process and will support requirements development, design reviews, and technical meetings throughout the development process. For example, the GASD supported requirement reviews, map engine evaluation and user juries, and provided geospatial support to the handheld platform demonstration for Joint Battle Command-Platform. The directorate also provides experimentation support for potential AGE solutions. In November 2010, it organized a Geospatial Summit, co-sponsored by the Army GIO and the ASA [ALT] system-of-systems engineer, to bring the Army's geospatial leadership, Army materiel developers and the AGC together to develop a way-ahead for implementing the AGE and socialize the intent, proposed benefits and way-forward for the enterprise.

The GASD works with industry partners, and will be developing a catalog of existing geospatial capabilities to assist materiel developers. For example, GASD negotiated an Enterprise License Agreement [ELA] with Esri, saving the Army over $26 million in licensing fees over five years, and is looking at the possibility of other industry ELAs to support the AGE.

The AGC also contributes to the enterprise capabilities of the U.S. Army Corps of Engineers' [USACE] civil works mission. The Corps' Inland Electronic Navigation Chart Program [IENC] is another enterprise GIS success story.

The IENC continues to be instrumental in building a data network for the nation's harbors and inland waterways by providing the Coastal Channel Framework and electronic and paper charts of all inland waterways to its end-users. The users represent the entire navigation community, including planning divisions, EOC, shippers, recreation users, pilots and environmentalists. Charts are updated monthly when new data is available. The IENC program continually interacts with other federal partners to ensure the highest level of navigation safety on our inland waterways and coastal channels. For example, more than 80 percent of the data on NOAA charts is from USACE, including channel data from dredging projects. The IENC program can also display data from over 12,000 U.S. Coast Guard buoys. In addition, the Coast Guard uses our hydrographic surveys to place buoys on rivers quickly and efficiently, saving many thousands of dollars on each buoy replacement trip.

This program drives the standard on inland waterway chart symbology and data quality provision through the development of its Inland Waterways Production System—an enterprise system designed to decrease data delivery time to the end user and provide a significant cost savings to the USACE by combining two production systems. Thus, one geodatabase, termed Nautical Solution, will be used for many products including electronic charts, paper charts, buoy overlays, and channel framework and other analysis.

The IENC program is also pushing new technology to its users by making its data available to mariners using mobile chart applications, decreasing data refresh times and therefore increasing navigation safety on our inland waterways. These applications include having the data available on all smartphones, iPads and web browsers. Other methods include RSS feeds and an XML catalog for automatic downloads.

Q: IPhones, iPads, and other handheld devices are being integrated into the soldier's toolkit due to their size, incredible computational power and visual clarity. How is the AGC working to populate these devices with its data?

A: The convergence of text, video, voice and imagery available in various shapes and forms from commercial, federal, state and local providers will benefit the Army and civilian sectors. Today, individuals can collect detailed images from their iPhones, Androids and other handheld "smart" devices with little or no GI&S training.

The Army is working to benefit from the speed, portability and computation power advantages offered by next-gen handheld devices, including the iPhone, Android and Blackberry. In fact, Army CIO/G-6 hosted an Apps for the Army [A4A] Challenge to help overcome mission-related challenges through the power of mobile and web devices. A4A is a marked shift from traditional Army development practices by using the latest in agile development methods while focusing on rapid deployment.

For example, we developed a top-five winning app for the Android called "Movement Projection." This is a map-routing app for road navigation that allows soldiers to input obstacles and threats—in

addition to stops, start and end points—and calculates the best and fastest route.

If the Army continues to invest time and effort into these apps, soldiers will be able to leverage the speed, processing power and portability of their "smart" devices in their daily operations.

Q: There is a lot of talk in Congress about making government more efficient, as well as proposals to curb funding. How can geospatial technologies be used as a way to help the Army "do more with less"?

A: Today, most functional areas collect spatial and temporal data to their own unique data standards. Some are proprietarily linked to either hardware, software, or both. This leads to a massive geospatial "back office," made up of separate stovepipes. Attempts to translate that data and conflate it between stovepipes are expensive, time consuming, and, in a war zone, overly frustrating. Now, we've demonstrated that there are enterprise GIS software and hardware tools available that can be tailored to accommodate the breadth of defense requirements for a shared and seamless COP in which every soldier is a contributing sensor. These successes become exponential with the increased communication and cooperation of different agencies working together.

This "force multiplier" translates to dollars and cents across DoD. The Army is poised to provide geospatial enterprise capabilities across all Army systems, which will save terrific amounts of money across

their programs and bring about greater effectiveness.

If you look at many industries, nongovernmental organizations, and state and local governments, it is clear this technology makes for better, more timely and cost-effective decisions. Their COPs are becoming integrated and fused from data collected on public utilities, to real estate, taxes and crime fighting.

Q: Is there anything that you would like to add?

A: Before the advent of smart phones, powerful and inexpensive computer processors, and an abundance of terrain visualization software, one's ability to collect, exploit and share geospatial data was hampered by cost, availability and compatibility constraints. Our soldiers are quite familiar with these tools and are leveraging them to their advantage by collecting, processing and sharing greater amounts of data with each other and joint partners. We must ensure that they have access to high-fidelity geospatial data, information and expertise. Headquarters, Department of the Army, the AGC and our strategic partners must also develop business processes that leverage the efficiencies afforded by the AGE to collect, process and deliver this data and information quickly and accurately. Solutions are here today, and it is possible to accelerate development, acquisition and deployment. Doing so requires engineers, mission command, the intelligence community and acquisition professionals to work together towards the goal of providing the soldier with the absolute best possible situational awareness. ✯

Synthetic Aperture Workhorse

RESPONDING TO GOVERNMENT NEEDS, INDUSTRY DEVELOPS A VARIETY OF TOOLS TO EXPLOIT AND ANALYZE **SAR** DATA AND TO INTEGRATE IT INTO GEOSPATIAL INTELLIGENCE WORK FLOWS.

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Synthetic aperture radar is becoming one of the workhorses of the U.S. military and intelligence communities, which in recent years have come to recognize the value of using SAR products for a variety of applications, including for tactical missions, mapping elevations, detecting terrain changes and a variety of other uses.

The myriad of potential uses for SAR is a testament to the technology's flexibility and utility. It can be mounted on satellites or on airborne platforms. It can concentrate on a narrow ribbon of territory or take in wide swaths. It can penetrate cloud cover and is not disturbed by most weather phenomena. It doesn't require daylight to generate useful images.

The U.S. government, since scrapping a radar satellite program a few years ago, has relied on commercial sources of data for its SAR needs. Industry has responded to this development with many recent innovations in this area, ranging from new hardware that is compatible with small UAVs to enhanced on-board processing capabilities and the development of a variety of tools designed to exploit and analyze SAR data and to integrate it into geospatial intelligence work flows.

Unlike air traffic control radar, for example, which sends out beams of energy and receives reflections of that energy that appear as blips on a screen, the antenna of an SAR system ranges for a period of time across a target area generating a two-dimensional image. "The image is derived from the long track along the flight path of a satellite to piece together points on the ground," explained Ian McLeod, director for defense and security at MDA Geospatial Services.

MDA operates two RADARSAT satellites that carry a SAR instrument capable of taking images at multiple resolutions ranging from one to 100 meters. The Canadian National Defense Department and the U.S. National Geospatial-Intelligence Agency, Navy and Coast Guard are among the major users of RADARSAT data.

The radar image differs markedly from the pictures generated by an electro-optical sensor, but contains much useful information that can be exploited in conjunction with optical images.

"Military users began taking interest in SAR two or three years ago," said Kevin Jones, director of marketing and product management at PCI Geomatics, a developer of geo-imaging software and systems. "They realized they could get more actionable intelligence with information from multiple sensors. SAR is particularly useful for change detection missions. It can detect very subtle changes on the ground."

That is because it is possible to extract measurements from SAR that are not possible from optical sensors, including ground deformation, human activity indicators and digital elevation models. "You can detect and measure phenomena in addition to typical image exploitation," said McLeod. "Many use SAR to complement optical assets. There are too many targets for the optical sensors and not enough capacity. When the SAR detects change or another item of interest, the user can then cue the higher resolution optical sensors to take a look."

DIGITAL MODELS

SAR digital elevation models have garnered a good deal of interest recently. "They can be rapidly produced over any area," said McLeod. "Our wide swaths and cloud independent imaging mean we can very quickly cover large areas." The RADARSAT satellites are currently producing images for 50,000 square kilometers per week.

"RADARSAT is especially well-suited for maritime applications, with very large swath widths up to 500 kilometers wide," said McLeod. "Our wide-swath modes are preferred for maritime surveillance, and we offer products that combine the SAR results with other information from optical and automatic identification systems to provide a maritime picture where none may exist."

Kevin Jones

SAR also has a long history of being used for ice monitoring. "Organizations like the National Ice Center routinely use RADARSAT imagery operationally to create ice charts used to support U.S. Navy and Coast Guard operations in polar regions," said McLeod. "SAR is also very good at detecting oil on water. RADARSAT-1 and RADARSAT-2 were used heavily by BP and the Coast Guard during the Deep Water Horizon disaster to monitor the spill and direct cleanup activities."

The development of very small SAR units now allows the technology to be installed on small UAVs. The NanoSAR system developed by a company called ImSAR, for example, has reduced size, weight and power consumption as compared to typical SAR units, so that it can now be mounted on Insitu's ScanEagle UAV.

"Our mission was to develop radar to go on small unmanned planes," said Adam Robertson, ImSAR's NanoSAR program manager. "NanoSAR is orders of magnitude smaller in size, cost and power consumption than other commercially available systems. NanoSAR weighs 2 pounds, consumes 15 watts, and measures 6 x 6 x 5 inches. Typical systems weigh 100 pounds, use hundreds of watts, and are the size of a small engine."

"We supported the development work enthusiastically," said Charlie Guthrie, Insitu's chief technology officer. "NanoSAR is the smallest SAR radar mounted on an airplane."

The ScanEagle was first developed in the mid-1990s by Insitu, which has been a Boeing subsidiary since 2008. It recently logged its 400,000th hour in the Southwest Asia theater.

"The ScanEagle was fundamentally an eye in the sky," Guthrie explained. "It always carried electro-optical and infrared sensors and video cameras. What SAR brings to the table is a completely different type of sensor. It can detect objects day or night. It can detect metallic objects better than video. Since it can operate in all kinds of weather it represents a new way to find things."

NanoSAR's range is narrower than those of larger systems, and it needs to be closer to its targets to produce valuable information. "But that happens to be where our system operates," said Guthrie. "We view it as an enhancement to our current capabilities."

ScanEagle is a 44-pound UAV with a 10-foot wingspan. Insitu has plans to integrate NanoSAR onto its larger, 135-pound platform called Integrator. The ScanEagle-mounted NanoSAR is currently being demonstrated for potential customers and is ready for market, said Guthrie.

Charlie Guthrie

Trip Carter

Multi-Band SAR

Another innovation that reduces size, weight and power usage of SAR systems, albeit for use on a much larger platform, comes from Northrop Grumman. Multi-Band (MB) SAR is a software-defined radar and real-time on-board processing system developed by Northrop Grumman Intelligence Systems with support from the Air Force Aeronautical Systems Center. The radar's multiple bands support many missions, including locating IEDs, imaging under foliage and into buildings, and detecting changes over a wide area. The ability to survey very large areas in all weather conditions, day or night, and to cue other on-board sensors enables airborne assets to provide real-time, tactically relevant information directly to troops on the ground or for border surveillance.

"The reductions in size, power and weight allow MB SAR to be installed on platforms such as such as Beechcraft King Air class aircraft," said Trip Carter, director of the airborne ISR mission area for Northrop Grumman Intelligence Systems.

MB SAR was integrated aboard a Navy NP-3D Orion aircraft as part of a Naval Research Laboratory program called Project Perseus. The aircraft successfully performed missions as a part of Task Force Observe, Detect, Identify and Neutralize, an ISR group that has operated in both Iraq and Afghanistan. Because the system is software-defined and designed for flexibility, Northrop Grumman's team was able to rapidly adapt to mission requirements as well as integrating, testing and calibrating the system in less than five weeks.

"Simply put, it has been used as part of a change detection process," said Carter. "It involves looking at a new image, comparing it to a prior image as a baseline and identifying changes. MB SAR is used to cue the system to put an eyeball on the target from an aircraft in near real-time to confirm something is there."

The advantage of MB SAR is that it can cover very large areas and provide highly accurate and precise images. "Because we operate at the lower end of the frequency regime, we are able to see a lot of territory," said Carter. "X-band SAR systems have the scope of soda straws. The system then maps out the changes that occurred over the previous flight. The ability to cover large areas translates to other types of missions such as foliage penetration and littoral surveillance."

Another advantage of MB SAR is that it has been integrated on a single airborne platform with other sensors. "The sensors are able to work collaboratively," said Carter. "The on-board processing capability is able to cross-cue different sensors to collect different kinds of data, including LiDAR data, in a multi-intelligence approach."

Light detection and ranging (LiDAR) uses laser light pulses from an airborne platform to gauge distances by measuring the time delay between transmission of the pulse and detection of the reflected signal to develop elevation models of terrain.

With the success of MB SAR's deployment with the Navy, Northrop Grumman is currently investigating other opportunities to deploy MB SAR to support broader airborne missions.

Software Tools

The increased recognition of SAR is also manifested by the growth the number of software tools being developed to analyze and exploit SAR data. MDA is currently working with ERDAS and PCI Geomatics on projects in this area.

"One of the challenges in the world of SAR is that it takes some know-how and specialized software to read the images derived from it," said McLeod. "You need an educated user, and you need to have appropriate tools in order to exploit the data."

Much of MDA's business is in providing intelligence products to customers with the use of its in-house, proprietary tools as well as with COTS products. The company doesn't market "shrink-wrapped software" to the general user public.

On the other hand, McLeod considers it to be "in the best interest of MDA to help GIS vendors develop the tools needed to interpret and exploit SAR imagery. The purpose is to collaborate to develop new SAR exploitation capabilities that can be made available on a wide scale."

In the case of MDA's collaboration with ERDAS, the latter "contributes their platform and their expertise, while MDA contributes the data and our expertise," said McLeod. "The goal is to make the advantages of SAR data more easily accessible to users."

A recently announced agreement between MDA and ERDAS will have the two companies embark on a series of pilot projects designed to demonstrate the utility of exploiting SAR data with ERDAS tools.

ERDAS has a long history of working with radar, noted Chief Technology Officer Brad Skelton, and has developed the Imagine Radar Mapping Suite, a bundle of tools for ERDAS Imagine that enables users to analyze and exploit radar data, including SAR data. The Imagine Radar Mapping Suite does not need to be reconfigured to work with SAR, but has been tweaked in order to read and interpret the SAR data.

The Imagine Radar Mapping Suite includes Imagine Radar Interpreter, which provides fundamental tools to preprocess radar images or enhance them for visual interpretation. "The tool enables speckle removal and radiometric calibration and terrain correction for radar imagery, and the ability to fuse radar and optical images," said Skelton.

Imagine OrthoRadar performs georeferencing and orthorectification of SAR images, using SAR sensor models, satellite orbit models and digital elevation models (DEMs). The Imagine SAR Interferometry module includes Interferometric SAR, which creates accurate, high-resolution DEMs from SAR image pairs, Coherence Change Detection, which produces georeferenced raster and vector change maps, and Differential Interferometric SAR, which enables precise mapping of surface displacement. Imagine StereoSAR DEM enables users to extract terrain height information from stereo pairs of RADARSAT data to generate accurate DEMs.

"We intend to continue to support radar as an important part of ERDAS Imagine," said Skelton.

Although a specific list of pilot projects has yet to be developed, Skelton surmises they will include applications for ice detection, soil change detection and ship monitoring, as well as oil spills and dumping.

Brad Skelton

"We are working with ERDAS in a number of areas," said McLeod. "The goal is to bring products to market. The timeline will depend on the progress of the work."

PCI Geomatics, a developer of geoimaging software and systems, recently announced a collaboration with MDA to implement software tools for ArcGIS using RADARSAT-2 demonstration data. PCI Geomatics introduced GeoImaging Tools for ArcGIS in 2010, and is currently developing a radar module, which will allow ArcGIS users to perform change detection, time series analysis, image classification, and feature extraction using RADARSAT-2 data as well as other commercially available SAR imagery.

ArcGIS is a leading integrated geographic information system from Esri.

PCI Geomatics has had a long relationship with MDA, stretching back to the initial launch of RADARSAT-1 in 1995. The technology developed by PCI at that time made it possible to analyze the imagery and develop operational applications using RADARSAT-1 data. PCI Geomatics added support for the next-generation RADARSAT-2 satellite in 2005. The latest development will allow ArcGIS users to run PCI Geomatics analysis tools on RADARSAT-2 data within the ArcGIS environment.

"Our key objective is to develop powerful, simple-to-use tools that can be integrated into GIS work flows," said Jones. "RADARSAT-2 imagery will be used to develop compelling application examples for GIS users to adopt SAR imagery."

The companies are going about their collaboration by collecting RADARSAT-2 data over locations in Europe, the United States and Canada—including areas of the Netherlands and Portland, Ore.—that will be used to develop operational demonstrations of SAR data. PCI Geomatics, together with Esri, will then prepare a series of demonstrations to educate the international community through a series of webinars and live demonstrations at trade shows and events.

Incorporating SAR data into ArcGIS will allow analysts to more easily generate actionable intelligence on ground disturbances using data from multiple sources, according to Jones. "It will better allow defense personnel to incorporate and combine multi-sensor data to pinpoint disturbances or problem areas," he said. "Our tool is plugged directly into the GIS toolbox. Multiple images can be accessed and automatically aligned in order to perform change detection. Using spatial and image analysis tools, users can detect changes of interest and produce a map that contains useful information that has been derived from the imagery."

PCI's current focus is to develop customized work flows for multi-sensor scenarios based on the market feedback the company has received this far. Ultimately, Jones is convinced that the PCI-MDA collaboration will provide richer analyses and make analysts' jobs easier.

"Current and future users demand going beyond the generation of image products alone, as multi-source imagery and derived products are fused with other data sources and presented in a form that is easily integrated with established operations," he said. "By linking proven radar image analysis technology to universal GIS data exploitation and dissemination, a new level of utility will be established." ★
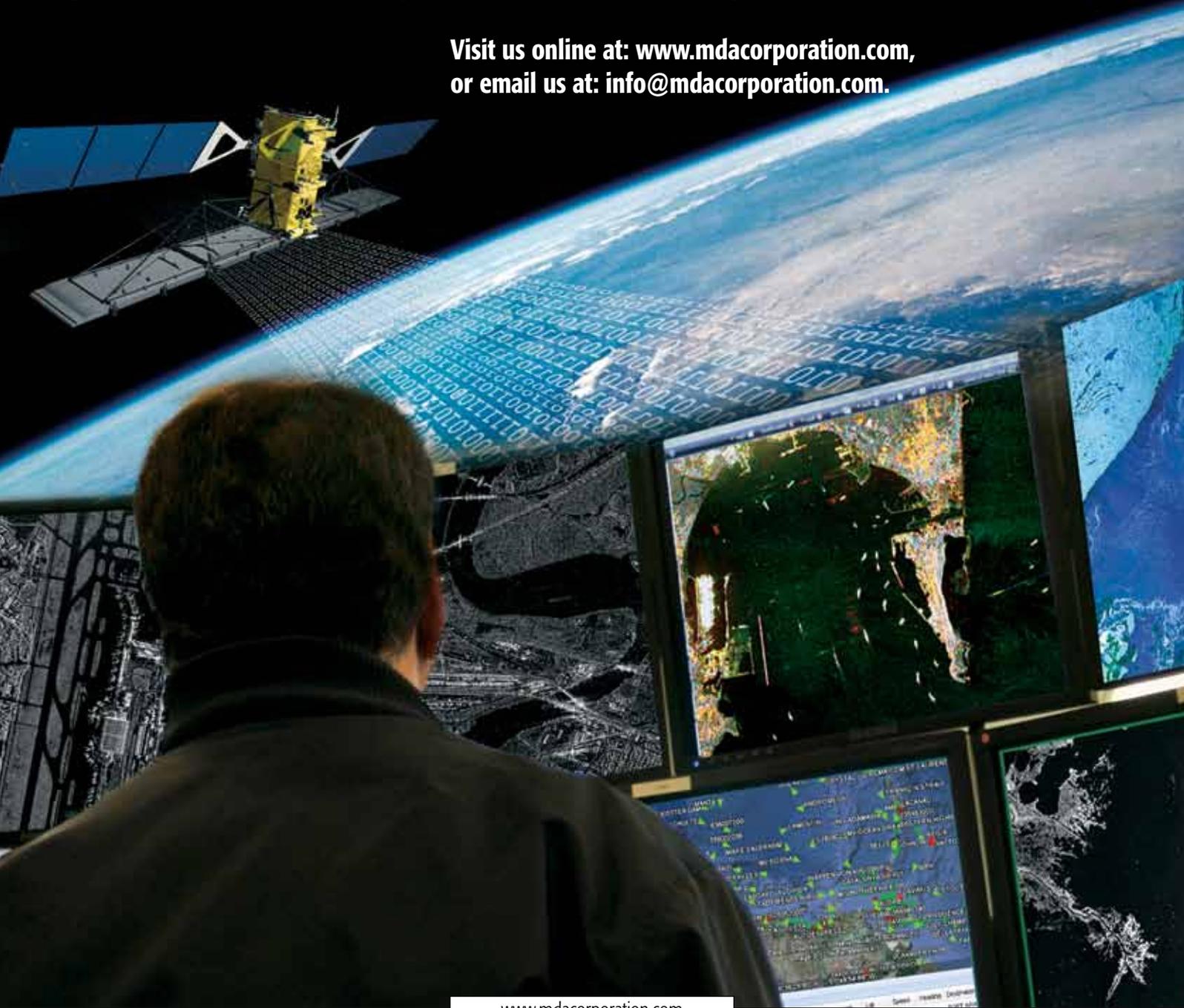
Cross-Domain GEOINT

TO ACHIEVE GEOSPATIAL SITUATIONAL AWARENESS ACROSS THE NATIONAL SECURITY COMMUNITY, DATA FROM NETWORKS OF DIFFERING CLASSIFICATIONS MUST COME TOGETHER SEAMLESSLY.

BY CHRISTOPHER K. TUCKER

The application of cross-domain security technologies to the world of GEOINT is not new. High-priority missions, innovative system designers and forward-leaning security officials have from time to time created the opportunity to apply these specialized and highly restricted technologies to the flow of particular kinds of data between particular networks for particular purposes.

For far too long, however, information sharing in this manner was considered an exception, not a rule. As such, this class of technologies was thought of, and even engineered, as point solutions without broader and more extensible application.

Those days must now come to an end. It is time for the era of cross-domain GEOINT to begin.

Achieving geospatial situational awareness across the extended national security community demands that data from many networks of differing classifications comes together seamlessly. While the average citizen assumes that such seamless geospatial situational awareness is provided to national security leaders, military commanders, operators and analysts as a matter of course, everyone in the business understands that this is simply not the case.

In the face of a host of commercially available cross-domain technologies, the establishment of the Unified Cross Domain Management Office (UCDMO), and executive orders that give the highest priority to solutions that will allow for the ability to share national security information, the lack of cross-domain security has led the level of geospatial situational awareness to be inexcusably thin. As GEOINT matures as a discipline and cross-cutting framework for intelligence and national security integration, it is time for it to become inherently cross-domain.

The Goal

The president of the United States should be able to draw a bounding box on a map, declare a slice of time, and discover, browse, access and exploit everything that the extended national security enterprise knows about a topic of interest over that location, at that moment in time. The president should be able to do this, at the click of a button, despite the fact that the source data resides on servers hidden behind a blinding array of unconnected/balkanized networks of different classifications.

While the commander in chief has many other demands on his time, it should be possible when crises hit to demand instantaneous access to everything on the situation room map. Sadly, he and his staff cannot—and it's not even close. Perhaps worse, the president's national security team, military commanders, warfighters/operators and intelligence analysts suffer from the same challenge.

Technology, Law, Policy and Culture

Many in Washington love to explain how the problems we experience with information sharing are due not to a lack of technology, but rather to culturally induced legal and policy limitations. It is said that since various agencies and their personnel are rewarded for hoarding information and breaking new intelligence, there is no incentive to reform the micro- and macro-level legal and policy frameworks that could improve information sharing, and in the world of GEOINT, geospatial situational awareness.
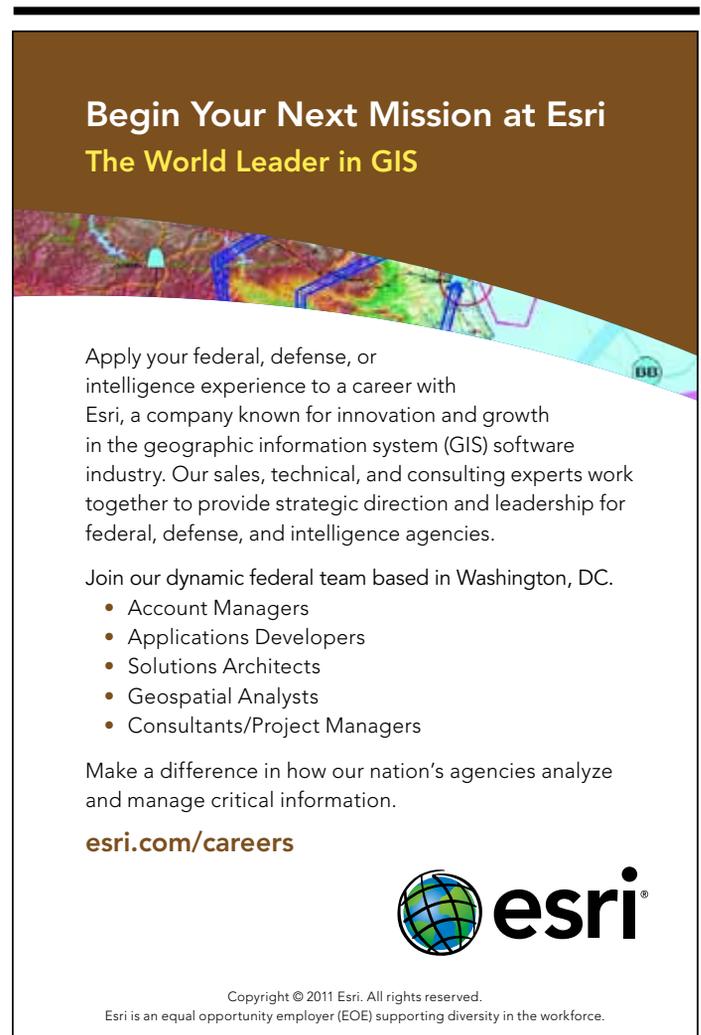
For the past decade or more, those voicing this worldview have often paid short shrift to the major technology challenges that have plagued the sharing of information across security domains. Point solutions have wrongly been touted as being wildly extensible to every possible cross-domain challenge. Innovation in the field has too often been neglected, and it certainly has not been the focus of widespread acquisition.

Despite this lack of attention to the technology challenges, a new class of cross-domain solutions has emerged that makes it possible to deploy bi-directional ICD 503 PL4/PL5 cross-domain solutions that are agnostic as to the data source, and capable of real-time streams of big data. That is, despite the system, technology pioneers have succeeded at rendering the technology issues moot. It is now time for leaders to demand the enterprise-wide adoption of their innovations.

Paralysis by Jargon

One of the reasons for the slow adoption of cross-domain security solutions across the National System for GEOINT, and the national security community more broadly, has been the arcane technical and policy jargon one must master for the successful deployment of these solutions. In the course of crossing security domains, it is not enough just to master the nuances of Director of Central Intelligence Directive 6/3-DCID 6/3 PL4/PL5 (or is it now Intelligence Community Directive 503 PL4/PL5?) documentation, configuration and mitigations.

You also master the DoD Information Technology Security Certification and Accreditation Process/DoD Information Assurance Certification and Accreditation Process criteria; DoD Intelligence Information System accreditation process support and documentation; DoD Directive 8570.1 compliant training and support; and Secret and Below Interoperability and Top

Secret and Below Interoperability, as well as the current state of thinking at any moment in time within the UCDMO.

Even worse, one must master the distinctions between Multiple Independent Levels of Security (MILS), Multiple Levels of Security (MLS) for the purposes of data access, and MLS for the purposes of transfer.

Each has been a valuable step in the evolution of information sharing. MILS desktops have enabled organizations and users to conserve on the hardware required to access data on different networks, with a MILS workstation that could be rebooted to access networks of different classifications. MLS desktops have enabled users to have views into data ("access") from different security domains on the same desktop at the same time, requiring no reboot or switching.

Even so, neither technology path enables the necessary transfer of data across security domains in order to enable actual processing and exploitation. What is missing in the MLS desktop is the ability to transfer information, data and images from one application/security level to another ("transfer").

Now that analysts are experiencing the benefits of access, their desire to transfer has become manifest. And, when operators and analysts discover that they can see and think in MLS, they immediately want to transfer in MLS. But this requires an enterprise that is cross domain at its very core.

An implementer not only must understand these disparate languages, but also must master the complex kabuki dance of dealing with multiple accrediting authorities, each with a different jargon and process. This even holds true when the domains being crossed are unclassified in nature (for example, NIPRnet to the World Wide Web), as everything is considered a "national security system," leading to costly and crippling processes. For many years, it has been unrealistic to think that any such cross-domain solution could be deployed generically across the enterprise when plagued by all of this technical and policy jargon.

POINT TO POINT MISSES THE POINT

While the executive orders demanding information sharing are clear in their mandate, the difficulties of achieving a multi-level secure enterprise that provides near-ubiquitous access and is operationally seamless to the user between disparate environments are significantly more complex than current point-to-point cross-domain security solutions can handle. The history of ICD 503 PL4 and PL5 controlled interfaces is not one of agility.

Historically, such controlled interfaces have been designed as single purpose devices deployed to secure the flow of particular data types for a single application between particular networks, and so have not been engineered to support the dynamism required by today's time-dominant information sharing challenges. There are presently commercially available controlled interfaces, however, that can be used as the keystone of an agile enterprise security infrastructure deployed on elastic cloud computing infrastructures.

It will not be enough to simply use more of the point-to-point PL4 and PL5 cross-domain solutions that we have used in the past. We must move to a new generation of cross-domain controlled interfaces, and the architectural concepts that underpin the future agile enterprise.

ENABLED IN ALL DIRECTIONS

In order to achieve an agile enterprise, cross-domain data flows have to be enabled in every direction. It must be possible for applications/users on a high-side network to transparently request data from a low-side resource (reach down). It must be possible for an application/user on a high-side network to transact data from the high-side via a low-side web service into a low-side database (transact down).

It also must be possible for applications/users on a low-side network to request data via a low-side web service into a high-side, label-aware database (reach up), and for client applications/users on a low-side network to transact data via a low-side web service into a high-side, label-aware database (transact up).

Obviously, only data of the appropriate classification should be able to move in any of these directions. In addition, no data spillage downward or insertion of malicious code upwards can be tolerated. Particularly since Army Private First Class Bradley Manning's alleged disclosure of classified data to WikiLeaks, it is critical that data be label secured, and that such PL5 controlled interfaces be in place as gateways to any data movement. Cross-domain controlled interfaces should be considered a key part of the strategy for mitigating the "Manning effect," rather than an enabler for future intentional or unintentional spills/leaks.

Legitimate, high-mission-value GEOINT workflows demand that each of these flows be enabled at the core of the enterprise. At the most basic level, data would ideally exist only once across the enterprise—albeit with appropriate redundancy—on the network of the data's classification, and accessible to all users on higher classification networks.

Analysts need to be able to dynamically and seamlessly bring low-side, time-dominant GEOINT resources into their high-side exploitation environments. Operators need to be able to dynamically and seamlessly release appropriately classified data resources from high-side environments to low-side users when crises occur.

In the case that data of different classifications reside in high-side repositories, there will be occasions when operators without clearances require the ability to reach up into that repository and access the data appropriate to their needs. Operators with no clearances, or operating from exposed environments, also must be able to contribute data into high-side exploitation environments by transacting data upward.

What is needed is to deploy an agile enterprise cross-domain architecture that can flexibly enable any such flow without developing an entirely new System Security Plan and the continual deployment of additional engineering resources. The GEOINT enterprise must be cross-domain down to its very core. ✭

Dr. Christopher K. Tucker is principal of Yale House Ventures and a member of the U.S. Geospatial Intelligence Foundation Board of Directors.

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Solutions Relay Location Information to Emergency Service Providers

In response to the Federal Communications Commission's (FCC) revised E9-1-1 compliance requirements, CommScope, a provider of infrastructure solutions for communication networks, is offering wireless operators a suite of new services.

The new CommScope E9-1-1 Compliance Testing Services, part of the Andrew Solutions Network Applications portfolio, include together or separately: analysis of existing maintenance test records; drive-testing in selected counties to determine existing location accuracy; and engineering recommendations for bringing networks into compliance where needed. The new FCC regulations require county-level instead of state-level reporting when determining E9-1-1 compliance. In addition to the testing and compliance services, CommScope offers a suite of location solutions that enables operators to transform their location-passive networks into reliable environments that are fully location-enabled. The GeoLens product line of location solutions brings together the elements needed to locate almost any user across networks and relay that information to emergency service providers and location-based service applications that enable new value-added services. GeoLENs location system products offer operators cost efficiencies, capacity and algorithm enhancements, and greater technology integration to address commercial and regulatory applications in an era of rapidly evolving networks, devices and customer usage requirements.

## DHS Seeks Remote Sensing for Incident Management

The Department of Homeland Security has issued a request for qualifications from private firms for "Remote Sensing to Support Incident Management and Homeland Security." Under the contract to be awarded, approximately four teams of firms will be under indefinite delivery/indefinite quantity firm fixed-price contracts for five years. Services to be provided via task orders under the contract will support emergency and non-emergency requirements for airborne remote sensing, which includes rapid deployment of aircraft, airborne imagery acquisition and processing, and rapid dissemination services. The services will consist of readiness reporting, deployment exercises, vertical and oblique aerial image acquisition, LiDAR, photogrammetric data processing, and electronic dissemination of imagery data for DHS. The solicitation was praised by the Management Association for Private Photogrammetric Surveyors, which first presented the idea of pre-positioned IDIQ contracts to federal officials several years ago. The organization argues that such contracts could speed the government's ability to respond to natural or anthropogenic disasters and emergencies, including floods, hurricanes, earthquakes and terror attacks.

Geospatial Agencies Rush to Japan Relief

Along with satellite imagery companies, which quickly made available comparative before-and-after images showing the devastation wrought by the earthquake and tsunami in Japan, key U.S. military agencies in the geospatial field have stepped forward to help in the response to the recent disaster. For example, the Air Force Electronic Systems Center-managed Eagle Vision imagery collection team rushed into action within hours of the event. The Eagle Vision team worked to order satellite imagery from a pre-established list of worldwide vendors, using imagery from various globally operated commercial satellite operators, including two U.S. firms, as well as firms in France, Germany, Italy and Canada. Disaster response officials use the satellite imagery to plan, prioritize and optimize their actions, often comparing overlays that contrast current conditions with pre-disaster imagery. Eagle Vision consists of five deployable satellite downlink stations that collect and process near real-time optical and synthetic aper-

ture radar imagery from commercial satellite constellations. The system ensures that U.S. forces, or in this case, disaster responders, have current, high-resolution imagery of the area of interest. Similarly, the U.S. Army Geospatial Center compiled earthquake, water and geology maps as well as other data sets of Japan and made them available via its public and public key infrastructure websites. Engineering route studies, geo-referenced PDF maps, a water consumption calculator and additional resources were provided to the Department of Defense, federal agencies, and other organizations. The center also compiled data for personnel utilizing the Defense Advanced Global Positioning System Receiver, a self-contained, handheld GPS receiver that provides highly accurate position, navigation and timing information to users under all weather conditions.
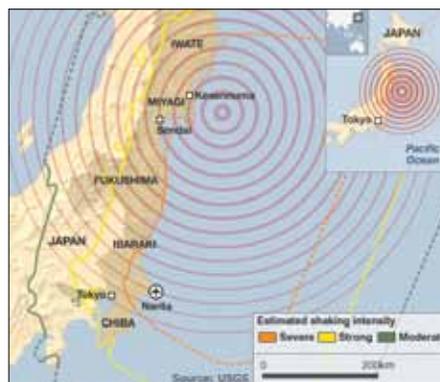
Mobile Alert System Provides Location-Based Emergency Messages

TeleCommunication Systems (TCS) has announced the availability of its hosted Commercial Mobile Alert System (CMAS) service. This service's location-based emergency alert messaging capability not only helps carriers to comply with the Federal Communication Commission's (FCC) Warning, Alert and Response Network Act, but also enables commercial message broadcasts of geographically relevant information such as enterprise notifications, traffic, news and coupons. The FCC issued the 2012 mandate to create a lifesaving service that will allow the Federal Emergency Management Agency (FEMA) to deliver timely and accurate emergency alerts and warnings to the cell phones of citizens in targeted geographical areas.

TCS' hosted CMAS service offers U.S. wireless carriers the ability to meet the 2012 CMAS mandate. The service accomplishes this goal by giving carriers FEMA-compliant location-based messaging capabilities that minimize the demand on carriers' infrastructure and financial resources. The service includes system design, integration, testing and deployment, and it utilizes TCS' proven public safety platform and TL 9000 certified facilities. The heart of the service is the TCS Alerts solution, a standards-compliant offering based on the company's patented E9-1-1 and location-based messaging platform. CMAS is intended to provide emergency managers and the president of the United States a means to send alerts and warnings to the public.

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September 19-22, 2011
BAE Systems GXP International User Conference
Chantilly, Va.
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October 16-19, 2011
GEOINT 2011 Symposium
San Antonio, Texas
http://usgif.org

Robert Horback
Vice President, Enterprise Engineering
TASC

Q: What types of products and services are you offering to military and other government customers?

A: TASC works side-by-side with military and civilian customers across the entire GEOINT community to provide programmatic and architecture solutions that influence strategic decisions for system acquisitions. Our customers are charged with protecting Americans at home, in the air, in cyberspace and on the battlefield. They depend on TASC to deliver the sophisticated solutions and technologies that make our national security and homeland security programs even more effective and efficient.

Q: What differentiates TASC from other defense companies?

A: From my perspective, the characteristics that make TASC stand out are the quality of our people and our commitment to shared values that guide our everyday activities. You often hear companies say their people are their most important asset, and this is absolutely true at TASC. We have a great mix of people with extensive military, GEOINT and science backgrounds, blended with new, fresh talent that brings in exciting concepts from the commercial sector. As a company, we strive to create a work environment that is both collaborative and inspiring, and to forge a strong bond of trust between ourselves and our customers.

Our "product" is sophisticated thinking and ideas that help our customers safeguard America today and well into the future. Essentially, our role is to forecast and solve challenges before they become problems. Only people can do that, and few people in the world can do what the people of TASC can do.

Q: What are some of the challenges you see in the geospatial sector?

A: One of the biggest challenges is implementing technology that will enable the shift from a "need to know" culture to a "need to share" culture. This is true not only in the GEOINT community but also across national and homeland security agencies at all levels—international, national and local.

Our country needs an information-sharing architecture that will make the right geospatial intelligence available to the right people at the right time. In other words, from the perspective of the end-user, we need an architecture that allows critical intel to be accessed at any time, from any place, using any device.

What I see more and more of today is our warfighters deploying on a broader range of operations that include what I would call nation building, disaster recovery and other humanitarian missions. Timely, accurate and relevant GEOINT is critical for these missions to be successful. Recent examples include the disaster in Haiti, the Deepwater oil spill in the Gulf of Mexico, and the earthquake and tsunami in Japan. In every case, our nation's response covered a broad range of support, all of which required global access to current and accurate GEOINT to succeed. This evolution requires increased collaboration across nations, borders and organizations.

The other big issue is the need for broader and deeper analytic depth. GEOINT analysts today spend too much time searching for data, with little time left over for analysis. Data overflow contributes to the problem based on the growing number of GEOINT sources coming online. We want to move from reporting historical location information to predicting events. The only way to do that is to apply new technologies.

One advanced technology that TASC has developed is a data analytics process that allows the end-user to fuse unstructured GIS data. Our data fusion process allows the user essentially to search without searching. The goal is to take the massive, nearly unmanageable volume of data that flows in every minute of every day and turn it into real knowledge. The result is that the analysis is better, faster, more affordable and timely.

Q: What other geospatial-related technologies are you working on?

A: TASC domain experts and app engineers created a mobile satellite application for the National Reconnaissance Office. Using any type of mobile device such as an iPad, the authorized user in the field can input ground coordinates into the app and task a satellite to take a specific image. The app has the capacity to task multiple satellites at once, so that the one nearest the location takes the image. The user can receive the satellite image in as little as an hour. This capability enables our people in the field to make good decisions by giving them access to the imagery they need when they need it.

Q: Like the rest of the federal government, the intelligence and military agencies are under intense budget pressure. What does that mean for TASC?

A: TASC has extensive experience in the acquisition process of national security systems. We apply proven, documented processes to help our customers control costs, predict schedules, avoid costly rework, and develop and objectively evaluate tailored capabilities. Ultimately, our goal is to help the federal government further reduce their developmental costs. It all comes back to the ingenuity of the people of TASC. Simply put, the people of TASC put their best thinking to work for great causes: peace, freedom, and the safety and security of America and its allies. ★

Esri Delivers Geospatial Capability for C4ISR
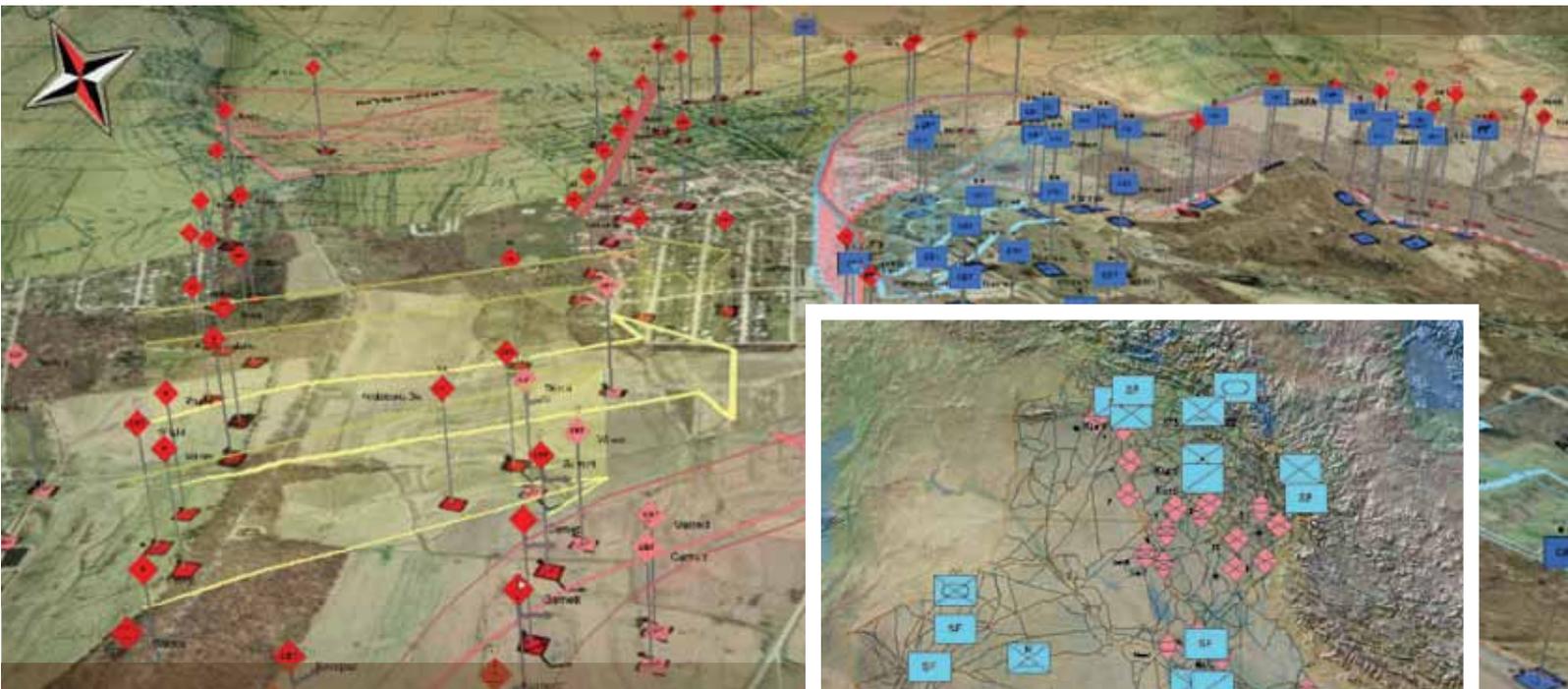
Whether you need to collect geospatial data on handheld devices or track enemy positions while working in a tactical operations center, technology from Esri supports you every step of the way.

As the world's most trusted source for geospatial technology, Esri works behind the scenes to provide the geospatial capabilities required to complete your mission. Our technology—on mobile devices, desktops, servers, and in custom applications—works 24/7, just like your operations.

Embedded into your C4ISR applications, Esri® software gives you the geospatial technology to manage the battlespace, integrate sensors, visualize the terrain, track targets, identify friendly forces, and more— all in a mapcentric common operational picture.

Esri also provides the main software components for both the U.S. Department of Defense Commercial Joint Mapping Toolkit (CJMTK) and the NATO Core Geographic Services (NCGS) contract, and we support United States and NATO military symbology (MIL-STD-2525C and APP6A).

Read how geospatial technology from Esri, like the software in the Commercial Joint Mapping Toolkit (CJMTK), was used to build battlespace visualization and decision support tools. Visit **esri.com/gif**.

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THE ARCHITECTS OF COLLABORATION, INNOVATION, EXCELLENCE, AND MISSION SUCCESS

Some of the U.S. government's most important agencies rely on the brainpower of TASC employees to solve some of their most complex challenges. Founded in 1966, TASC is one of the most recognized independent providers of advanced systems engineering, integration and mission support to the defense, intelligence, and federal markets. **TASC—the right people, the right knowledge helping you make the right decisions.**

TASC