

Next Stage of Geospatial Software

AS TECHNOLOGY CONTINUES TO ADVANCE, INDUSTRY EXECUTIVES PREDICT THE FUTURE COURSE OF MILITARY AND INTELLIGENCE USES.

GIF recently posed the following question to executives of some the leading companies in the field of geospatial software: "What do you see as the next stage in the future of military and intelligence use of geospatial software?" Their responses appear below.



Near Real-Time Tools

New video systems will require highly scalable image processing algorithms, along with artificial intelligence levels of data analysis.

By Jon Skiffington

Director of Product Management, LizardTech

The trend over recent years has been collection of more and more information, particularly raster and video data. Certainly the goal in future years will be persistent surveillance. But persistent surveillance, while providing unbelievable amounts of data for analysis, carries with it its own problems.

First, there is that of storage. High-resolution, single-frame images by themselves take up a vast amount of space, but this is a problem that can be solved via compression technologies, including those such as LizardTech's wavelet-based MrSID format. With wavelet methods, images can be reduced greatly in size but still kept at very high visual quality.

Additionally, there is distribution. While units at the battalion level and above tend to have reasonably high bandwidth connections, distributing large data products over spotty connections to the company level and below is still problematic. A number of image servers are on the market that can help resolve this issue, but it still

presents a challenge in bandwidth-starved environments.

With video, however, this problem is even worse. While some sensors now may only have four cameras collecting lone or two frames per second, future platforms will be capturing 30 or more simultaneous streams of full motion, HD-quality video. Storage and distribution of this data will become orders of magnitude more difficult than that of static images. New GIS software, and likely specialized hardware packages, will need to be brought online to address the challenge of video data compression and dissemination.

Even more daunting, however, is that of video analysis. Video currently works well as a forensic tool to determine where an incident occurred and for "backtracking" to account for vehicles and persons of interest. Long term, however, video needs to be used as a real-time exploitation tool. This is not a process that can be done manually. Personnel costs are too great to dedicate individuals to monitor discrete

video feeds. Additionally, the human mind simply cannot focus on one, let alone multiple, video feeds for any significant length of time.

The next sea change in GIS software for intelligence purposes will be the development of tools that can perform near real-time analysis for situations of interest in video feeds. How this will be done is still to be determined, of course, but it will certainly require highly scalable image processing algorithms, along with near artificial intelligence levels of data analysis. Additionally, data fusion will be critical to the success of these systems. Combining SIGINT data with traditional GIS data, along with other sources, will greatly help to determine situations of interest.

While many organizations are working on solving these problems, it's certain that cooperation and partnership amongst private companies and government organizations will be necessary for these solutions to flourish. ★



Enabling the End-User

The future of geospatial intelligence rests in the ability to provide actionable intelligence to the military and intelligence community in the field.

By John Olesak

Vice President of Integrated Intelligence Systems, Northrop Grumman



In today's technologically saturated world, there is a seemingly limitless amount of GEOINT data available. Over the last several years, industry and the government have nearly perfected data collection and are now focused on how to effectively integrate and analyze all of the information in a multi-INT environment. Compounding that challenge is getting the right data into the hands of the user when they need it and in the right format.

In her speech during the 2010 GEOINT Symposium, National Geospatial-Intelligence Agency Director Letitia A. Long outlined a vision for the future that included providing the end-user with "online, on-demand access" to GEOINT knowledge through support for multiple devices. Development of new technologies and applications makes it possible to bring this vision into reality.

Whether you are a data consumer or provider, you need access to both data and applications that are tied specifically to your mission. This concept is changing the way providers and end-users are handling data today.

Traditionally, data has been mined by the user, requiring them to know the information exists and how to find it. However, the future of GIS software, supported by increased bandwidth and new dissemination techniques, allows actionable intelligence to get into the hands of the user quickly without requiring them to spend precious time searching and compiling the information.

The military and intelligence community is working to get GEOINT data to those that require it to make decisions in a timely and efficient manner. Mobility is a key tenet of this concept. The latest GIS software needs to enable the end-user through the use of technology such as smartphones and tablets, providing them access to both data and tools to make tactical decisions without waiting for intelligence to be pushed to them.

Additionally, the end-user is a critical part of the collection process in that they will be able to more quickly identify gaps in available data to enhance the overall information, but they should not be required to have an advanced degree in data collection or

analysis in order to make effective use of the information. Future solutions will become more automated and easier to use, allowing the user to receive multi-source intelligence at their fingertips with little training on the collection or analysis systems.

These solutions will include "smart clouds" that tie applications and data together such that consumers are not required to be experts in a specific intelligence domain or software product in order to effectively utilize the information provided. These systems will tie multi-source, multi-intelligence information together with little to no direct intervention from the user other than establishing a query profile or asking questions of the system.

The future of geospatial intelligence rests in the ability to provide actionable intelligence to the military and intelligence community in the field in order to complete their mission. The future of GIS software will allow the user to utilize all available information without significant time spent in becoming an expert in multiple pieces of software and intelligence types. ★



Integration, Mobility, Collaboration

It is up to industry providers to fulfill the emerging and future needs of the intelligence community.

By Rick Cobb

Chief Executive Officer and President, TerraGo Technologies



The future use of geospatial software by military and intelligence clearly lies in integration, mobility and collaboration. Director of National Intelligence James R. Clapper recently issued a new mission for the office he directs that focuses exclusively on the concept of intelligence

integration. The Office of the Director of National Intelligence believes thorough intelligence integration is vital for ensuring that the IC delivers the highest quality intelligence with the right inputs across many levels. In addition, Letitia Long, director of the National Geospatial-Intelligence

Agency, highlighted her vision for the future of GEOINT at the U.S. Geospatial Intelligence Foundation's GEOINT 2010 Symposium, which focused on putting the power of geospatial intelligence directly into the hands of the user—on a "mobile device or by the means of their choosing."

As for collaboration, recent high-profile military and intelligence successes have demonstrated that the future lies not only in better sharing of geospatial intelligence within an agency, bi-directionally between analysts and field operators and with key decision-makers, but also interagency, between intelligence, military and an even broader group of organizations.

Geospatial collaboration software must support these strategic goals to better enable the warfighter intelligence professional to fully leverage GEOINT for effective mission planning and implementation. From producing interactive, compact GeoPDF maps and imagery on demand, directly from Web-based digital imagery sources, to delivering dynamic GEOINT content in connected, mobile or offline environments, to sharing situational updates from the field in real-time, new levels of functionality are expected from the traditional

leading software providers and new innovators alike.

The military is relying on the geospatial software industry to develop solutions that can be used by any warfighter—even if not trained in GIS. Along those lines, the military and IC need to be able to provide the proactive delivery of spatial information based on mission, location and other variables. This will ultimately enable the warfighter to personalize intelligence, collect additional intelligence in the context of their various missions and effectively share new intelligence with others in the battlefield.

For far too long, the focus has been on the collection and analysis of data, whereas the shift will now be more on self-service and proactive dissemination of geospatial intelligence and enabling collaboration in any environment.

The IC is also looking for more dynamic and highly interactive

intelligence reports that are supported by geospatial software to provide on-demand georeferenced content such as video, audio and Web services. Real-time reporting of highly interactive situational data will continue to be a major priority and will reinforce the overall effectiveness of our military missions.

Director Clapper once noted that GEOINT is the foundation for all other intelligence disciplines. As such, it is up to industry providers—including TerraGo Technologies, a pioneer innovator in geospatial collaboration that offers solutions to produce, access, update and share GEOINT—to fulfill the emerging and future needs of the IC. The correlation between successfully meeting GEOINT requirements and securing our nation is becoming more clearly defined every day, making the field of geospatial intelligence software an increasingly exciting and rewarding place to work. ★



From Where to When and How Long

Non-geospatial links between individuals, activities, relationships and affiliations can be as important as the geospatial ones.

By Dennis Lambell

Vice President and General Manager, BAE Systems' Geospatial-Intelligence Solutions

Activity-based analysis (ABA) and human geography (HG) are emerging trends in GIS. But if you look closely, they're not really new concepts. Rather, the increasingly dynamic and social nature of data is extending our traditional paradigm beyond simple geospatial visualization.

Activities are no longer just geotagged and attributed. They now include a level of sophistication and subtly involved context and relationships. When something happened and for how long is as significant as where it occurred. It is as much about the non-geospatial links between individuals, activities, relationships and affiliations as it is about the geospatial ones. Let me offer a couple of real-life examples.

We're all familiar with the links and networks inherent in social media

sites, such as LinkedIn, Facebook and Twitter. I post information about myself and join groups, therefore becoming an attributed entity in a large relational database. I "connect" with colleagues on LinkedIn or "friend" relatives and neighbors on Facebook, making myself part of a complex network of inter-linked entities.

I may choose to post and tag pictures to Facebook or tweet messages that describe what I am doing with whom and where. I may even tell you my club memberships, personal interests, birthday, spouse's name and alma mater. My friends can become your friends as you get to know them through the network. Emerging social media sites like Groupon extend the concept of the social graph to include places and activities relevant to lifestyle.

As a result, I can pose questions like, "I'm going on a business trip to Milwaukee. Do I have any friends or friends of friends who live there? Do any of them like jazz music? Can any of them advise me on really good jazz clubs to visit while I am there? Are any of them already attending? Would they like to join me?" These questions interlace GIS (the where and when) with HG and ABA to provide you with information to identify relevant relationships and activities.

These questions are good surrogates for even more interesting and useful geospatial-intelligence questions that are becoming increasingly answerable. The visually engaging and interactive environment of GIS is the foundation, but extending the paradigm to other dimensions of human activities and relationships enhances

the user experience or may be essential to the answer I'm seeking. We need new ways to visualize this complex, rapidly changing and often uncertain information. We must transition transparently among geospatially centered,

transactional and relational views to fully understand our environment.

Over the past 30 years, GIS has become part of our world. Now I'm excited about how quickly new technologies for ABA and HG are

becoming integrated into our GIS tools, workflows and mobile devices as we incorporate the complex inter-relationships between people, groups, places and activities into everything we do. ★



Common Context Across the Enterprise

To discover, comprehend and act upon information within the dynamic geospatial enterprise, users need a common reference point.

Kirk Benell
Chief Technology Officer
ITT Visual Information Solutions



Today's geospatial users are facing difficult challenges to meet the tasks placed upon them. The proliferation of sensors coupled with a continuously connected environment has led to shorter analysis time cycles and the demand for rapid delivery of products based on all information available. Day-long operations that focused on siloed, single-source analysis are in the past; today's operations require a holistic approach, leveraging all information available to deliver products in hours, not days.

Enabled by advancements in mobile platforms, ubiquitous and resilient networking and enterprise-wide software systems, the geospatial user of today is being inundated by information. While fulfilling an operational need, this deluge of information is difficult to manage, especially in the time-critical environment of military and intelligence operations.

To successfully discover, comprehend and act upon information within the dynamic geospatial enterprise that exists today, users need a common reference point; they need an understanding of the context they are working within. A common geospatial context or geocontext provides

a common reference, and GIS software is the key enabling technology to deliver this context across the entire geospatial enterprise.

Today's GIS software systems extend throughout the enterprise, delivering a common, fully connected geospatial platform. Following modern enterprise deployment patterns, GIS systems provide a diverse yet fully connected system that extends from the sensor to all client points within the enterprise. Upon capture, sensor data in these systems is published to the GIS enterprise, making it available to any authorized client and delivered within the common geocontext that the GIS provides.

While the ability to rapidly capture, publish and disseminate information within a common geocontext is a key enabler provided by modern GIS systems, information exchange alone isn't the complete solution. The delivery of raw sensor data to an end-user rapidly saturates their decision process. True operational advancement is achieved through automated extraction of high-value intelligence within the geospatial enterprise.

An example of this type of GIS-enable system is shown today through

the integration of Esri's ArcGIS product suite and the ENVI product platform from ITT Visual Information Solutions. The ArcGIS platform delivers an enterprisewide GIS solution that can collect, manage and disseminate geospatial information. Through the integration of ENVI's extensive remote sensing exploitation and classification capabilities within the ArcGIS platform, raw sensor data is automatically transformed into actionable intelligence and immediately made available throughout the GIS Enterprise. ArcGIS delivers a common geocontext to the system, while ENVI provides the advanced algorithms to transform geoinformation into geointelligence.

While the connected geospatial enterprise systems deployed today are revolutionizing information and knowledge exchange, the diversity and volume of information is also overwhelming the military user. Intelligent information extraction and a common geocontext is one method to overcome this overload. Today's geospatial software systems provide this capability, delivering the right information at the right time and ensuring overall mission success. ★

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