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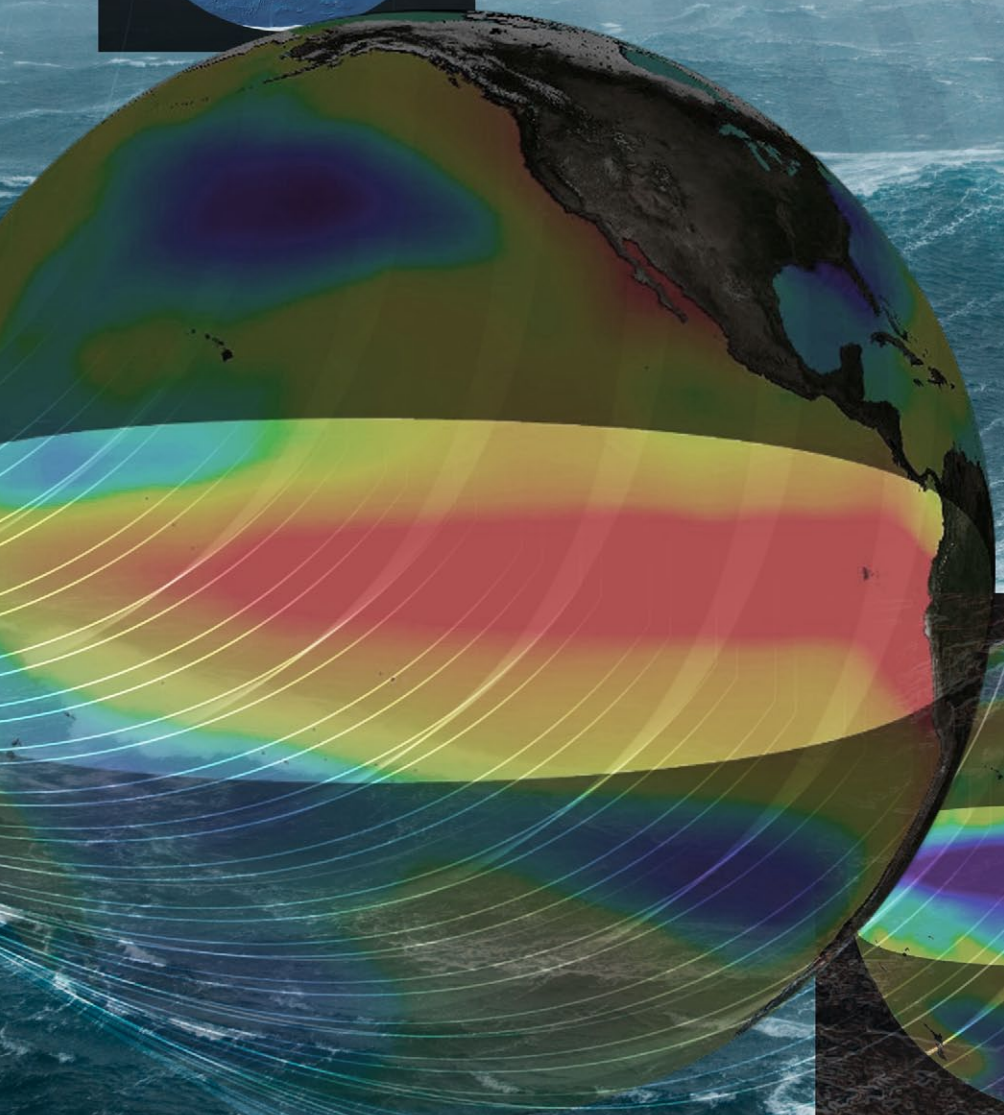
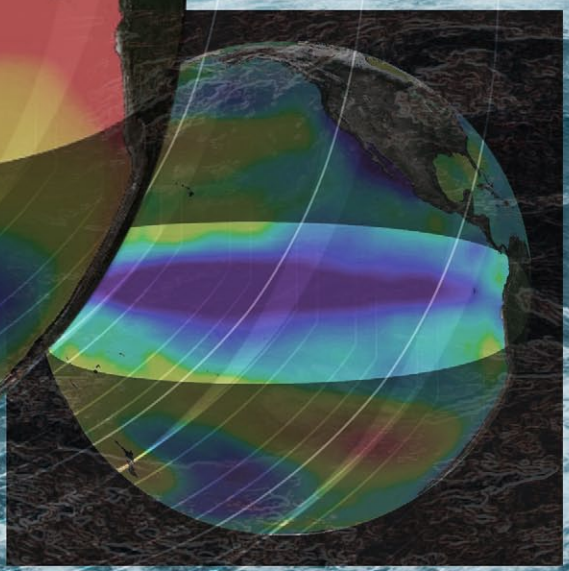
ON THE FrontLines

Geospatial

APPLICATIONS IN GOVERNMENT





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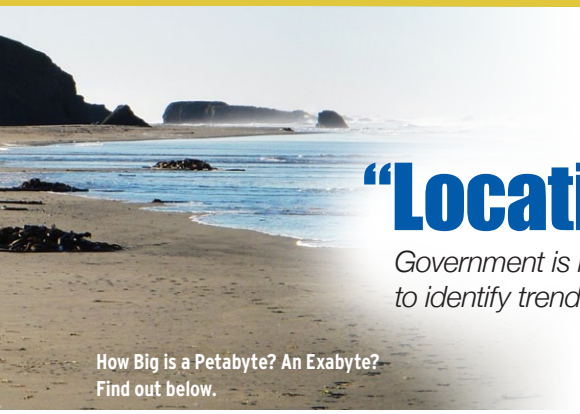
By Jeff Erlichman, Editor, On The FrontLines



"Location, Location, Location"

Government is relying more and more on location-based geospatial data to identify trends and transform processes.

How Big is a Petabyte? An Exabyte? Find out below.

Mobility today means every person is a sensor gathering geospatial data.

Wherever we go, whether we walk, drive, bike or fly, we are continuously producing new location-based geospatial data. Visualization of that data makes it easier for us to make everyday decisions.

Today, everybody knows about geospatial intelligence or GEOINT. It is now part of our DNA. It comes in the form of maps on mobile phones, navigation systems in cars, and online programs such as Google Maps, Google Earth and Bing.

In government, organizations such as the National Geospatial-Intelligence Agency (NGA) and the Army Geospatial Center (AGC) have programs that are fundamentally changing the user experience. They are providing online, on-demand access to NGA GEOINT knowledge and data and creating new value by broadening and deepening their analytic expertise.

On the civilian side, the Federal Geographic Data Committee (FGDC) recently launched Geospatial Platform (www.geoplatform.gov) to allow government, industry and public users to use federal data collections on common geographic maps. And there are other search engines available such as the National Atlas or Geospatial Data Gateway.

In its "Building The Business Case for the Geospatial Platform: The Value Proposition", the FDGC outlines in great detail the benefits of using geospatial information to communicate clearly; put issues and events in context of location; integrate multiple data elements and disparate types of data through one map or view; and recognize trends and relationships that might otherwise be missed.

Everything is geared towards converting this data to actionable information and putting it in the hands of as many people as possible. But managing all this geospatial Big Data and delivering it at the speed users demand remains a challenge for the IT industry.

How big is big? During a recent Federal Executive Forum, Nick Combs of EMC Isilon explained that "if a byte of data was a grain of sand, a Petabyte of data would be all the sand in a beach a hundred yards wide, one foot deep and a mile long."

Combs said by 2018 we are going to be thinking about Exabytes of data. "That's all the sand in a beach the entire length of the coast of the United States." Then if you think about networks to support it you can multiply that times 8 because there are 8 bits in a byte."

Managing all this data will be one of the IT industry's greatest challenges. The process of integrating geospatial technologies into traditional IT stacks to do business intelligence is just beginning. The best is yet to come. ■

Geospatial Leaders Speak Out

Joseph Klimavicz, CIO
National Oceanic and Atmospheric Administration
Everything's got a geospatial component and when you take advantage of that information you make better decisions. And we need to make better decisions at every level.

Jim Griffith
Deputy Director of the Vision Integration Team
National Geospatial-Intelligence Agency
In a hurricane you want to know where the hospitals are or what the infrastructure looks like; NGA has developed an application for a mobile device and desktop that is able to tap the data to show you what it is you are interested in before the hurricane hits.

Todd Byler
Geospatial Management and Services Team Leader
Army Geospatial Center
Geospatial presents a whole new level of processing. Every time you increase the resolution of an image or a raster elevation data set by two-fold, it quadruples the size of the data, so it can be rather voluminous.

Inside

4 1 Pix Is Worth (Way More Than) 1,000 Words
8 Army Updates CMB Online
10 On Demand Geospatial Platform
12 Jim Griffith, NGA Interview
14 The ABCs of Big Data
15 What You Can Do With Geospatial Analytics
16 Building A Better Geospatial Customer Experience
17 NGA Hosts Geospatial In The Cloud
18 Resources

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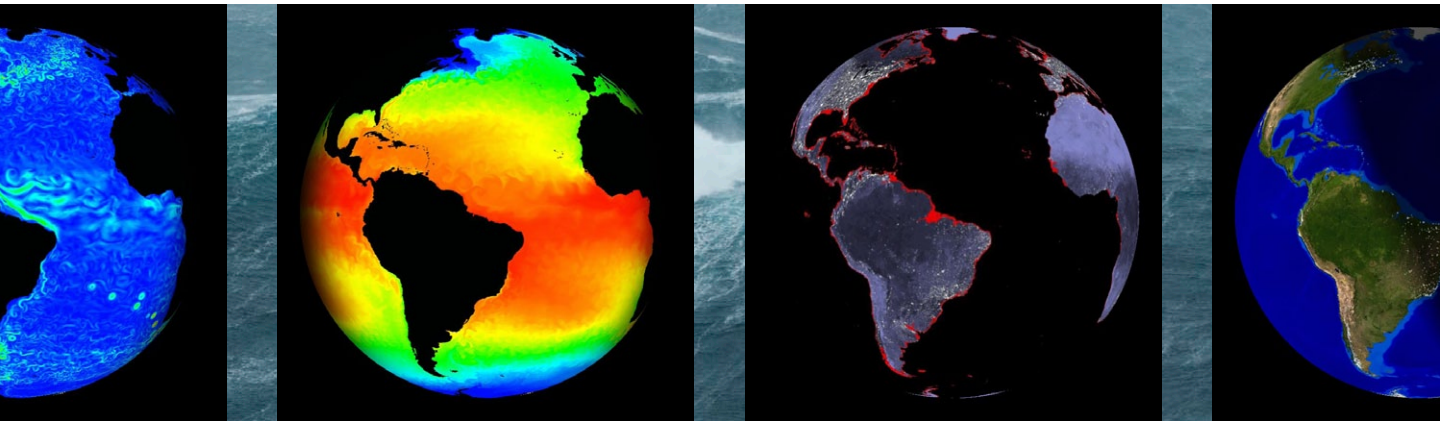
As technology allows more geospatial data to be captured, there is more Big Data to analyze.



In fact NGA is using Google Earth Builder — one of the first major government geospatial cloud initiatives to host its geospatial data and information. This allows NGA to customize Google Earth & Maps to provide maps and globes to support U.S. government activities.

Harnessing Big Data

For NGA's Griffith the most important element in Big Data analytics is how to use it to enable their human capital. "Our needs are about addressing national security interests and answering national security and key intelligence questions. We want to automate what can be automated, but it needs to be automated in such a way that it enables our analysts to do that people analytics. And so that's where we are focused on the big data discussion."

At NOAA, CIO Joseph Klimavicz is also grappling with harnessing Big Data.

In a recent interview, he said the agency has been working on building integrated earth system models that take into consideration very complex processes in the ocean and atmosphere. "We measure these chemicals in the atmosphere but we are still trying to understand how they interact and what they mean to weather and climate. So we are building these huge mathematical models and that is requiring an awful lot of supercomputing resources," he added.

"My definition of Big Data is the data becomes so large and so complex that you actually need a supercomputer to do the analysis. But the opportunities are tremendous because you are able to gain the science to make better solutions."

Klimavicz said another huge area is advanced visualization with geospatial capabilities. He said in addition to putting out some advanced visualization capabilities out on our website, NOAA has also launched Science On A Sphere (SOS).

According to NOAA, SOS "is a room sized global display system that uses computers and video projectors to display planetary data onto a six foot diameter sphere, analogous to a giant animated globe. Animated images of atmospheric storms, climate change, and ocean temperature can be shown on the sphere, which is used to explain what are sometimes complex environmental processes, in a way that is simultaneously intuitive and captivating."

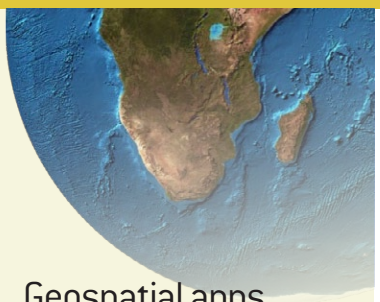
There are 75 SOS's. Learn more at http://sos.noaa.gov/.

Unintended Consequences

Todd Byler, Geospatial Management and Services Team Leader at the Army Geospatial Center (AGC) told OTFL that sometimes having higher resolution and more detail can have unintended consequences.

"As Dr. Joseph Fontanella (AGC GIO) mentioned, with all this data, you have to be careful not to drown your users in data, because they get lost in the noise," Byler said.

"You'll find a big industry trend is that everyone's getting higher fidelity or higher resolution imagery elevation data with the onset of new sensors like LIDAR sensors and IFSAR sensors for doing very high resolution imaging and elevation monitoring. People are getting just an immense amount of data now. It's that old adage, be careful what you wish for, you might just get it."



Geospatial apps are creating vast new stores of data and new perspectives on public policy, commerce and democracy.

Byler noted that people always thought that high resolution imagery and elevation data would solve all of their problems. "I think what you are finding is that it's really just presenting new problems that were perhaps unforeseen in the past with the low resolution imagery and elevation data.

Byler said the algorithms that were developed over the past decades to change data into information were basically designed to glean some sort of answer or analysis out of the data. They don't work with the high resolution data and they have to be modified or re-engineered from scratch to deal with the new high fidelity data.

"A good example is a LIDAR data sensor can actually see almost every feature, especially in urban terrain, you'll see mailboxes and fire hydrants and lamp posts and all sorts of things like that. That can be considered noise depending on what you are trying to do. Perhaps the smallest feature that would appear in a data set a decade ago would be a building, not a car parked on the street next to that building. So this is where one has to be careful with the magnitude of data that's emerging in the geospatial field right now."

Byler said geospatial advances present a whole new level of Big Data processing. "Every time you increase the resolution of an image or a raster elevation data set by two-fold, it quadruples the size of the data."

Klimavicz summed up succinctly just how important harnessing geospatial technologies are. "Everything's got a geospatial component and when you take advantage of that information you make better decisions. And we need to make better decisions at every level." ■

Thirty Years of Progress

Joseph Klimavicz
CIO
National Oceanic and Atmospheric Administration

In his 30 years of federal service, Joseph Klimavicz, CIO at NOAA has seen the exponential growth geospatial capabilities and data. In a recent interview, I asked him to talk about some of the advances he has seen over three decades.

"Looking at it from a federal perspective, hard copy was dominant 30 years ago. To build geospatial files was very time consuming. Landsat was really the only commercial source of satellite imagery and had very poor resolution compared to what we have today," Klimavicz explained. "With computers and GIS software relatively primitive, even after collecting the data, the compute power really wasn't there, certainly not at the desk top."

Now with improvements in hardware and software and driven by the exploding consumer market, today, geospatial technology is embedded in virtually everything.

"From my perspective the biggest change has been the role of the federal government. We used to be almost a single authoritative source of geospatial information and now we are more in the role of coordinating, managing, facilitating the interagency, intergovernmental kind of role," Klimavicz said. "That's what came out of the building the Geospatial Platform."

Klimavicz spends most of his time now focusing on working cooperatively on harnessing these very large and disparate data sets and making sure they are managed appropriately and are available; and then he works to ensure geospatial information is being used as effectively as possible to address our nation's most critical issues.

"I would say we are doing a lot of this by leveraging industry's progress and continuing to encourage innovation and trying to collaborate as broadly as possible with government, stakeholders and partners. And one of the most critical things we can do is to clear policy obstacles in making it easy for people to use geospatial information and services."

Army Updates CMB On-line

The Army's new Common Map Background (CMB) online version shortens the time and expense customers need to acquire, manage and load/import CD-ROMs of geospatial data pertinent to their area of operations.

The new CMB On-line geospatial data discovery and ordering program allows customers to search, download and/or order geospatial data using a simple, web-based "shopping cart" interface.

The latest version of CMB On-line performs faster than the previous iteration and offers several new features to users. These include easy-to-change map bases, a scale display and a coordinate display via latitude/longitude decimal degrees, Todd Byler, Geospatial Management and Services Team Leader at the Army Geospatial Center (AGC) told OTFL in a recent interview.

Byler recounted how the CMB was started to bring some configuration management to the battle and mission command systems out in the field and make sure everybody was looking at the same maps.

"A lot of weapons systems today actually have map and image displays built into them, just like your car may have a GPS system built into it," Byler said. "Tanks and howitzer systems have a display in them now. And they all need to get their map data from somewhere. This was an attempt to try and bring some configuration management, some standardization to that community so that everybody's looking at the same thing on the screen."

Surgical Selection of Data

In the past, Army customers would typically end up ordering the data sets they needed from the Defense Logistics Agency, which did the transaction for NGA.

They typically would end up getting hundreds of CD-ROMs

for a given area of interest, which could take a soldier days, if not weeks, just to load and process that data, before he can even get down to business said Byler.

"That's one thing that the CMB brings to the table. We don't distribute data that way," he explained.

"We can very surgically select an area of interest from our data library geographically or geospatially. We can also select out an area of interest and numerous different data types that coincide with that area of interest, and then provide that data on media that is pretty much plug and play."

"We like to be as application ready as possible. So the soldier that's going to receive that data set can plug that into their system. They can use it directly or they can upload it to their system, and hopefully it's in a form that they have to do very little preparation to that data before they can basically get down to business."

Byler said that's really a big time saver just in itself. "It sounds pretty simple; it can be a little more complicated than it sounds. So we are basically distributing data typically on external hard drives that can be anywhere from a couple of hundred gigabytes up to many terabytes on one hard drive."

Geospatial Filling Stations Transform AGC Business

What the CMB allows customers to do is to go online, actually see for themselves what is available in great detail, thus making searches more efficient.

"So now a user can go on the web and zoom in on a map in your particular area of interest," Byler explained. "You have a number of different base maps that you can toggle on and off to get a better picture of what you are looking for. From that you can check boxes next to the different data types and find the extent of coverage."

While the master CMB data warehouse is at AGC headquarters, Byler said there are "forward CMB workstations at some Army units and they have a subset of our master data warehouse here loaded locally. We keep those synchronized with our master warehouse here and we refer to those as the geospatial filling stations."

That way users don't have to come all the way back to HQ to get a data load, can actually visit one of these geospatial filling stations to get the map and imagery data, the geospatial data that they need for their application.

Byler also said AGC is providing a lot of online services now through standard network protocols, many of which are standardized by the OGC (Open Geospatial Consortium).

"If you have a standard application that speaks the standard network protocols, such as the web mapping service (WMS), you can actually tap into our services on line and interact live with our servers directly," Byler said.

"You don't have to download data at all; you can be tapping into many terabytes of data here and none of it is downloaded into your local work station. It's like how Google maps works; you've got a map on the screen and you can zoom in and zoom out and things like that, but none of that data is actually getting loaded onto your work station other than a few temporary files." ■

CMB Fast Facts

The Army Geospatial Center's (AGC) Common Map Background (CMB) program provides the capability to assemble, host, maintain and disseminate a common geospatial map data library. The library includes the latest and best available National Geospatial-Intelligence Agency (NGA) data as well as AGC products. Data and/or products from the CMB data library are provided as requested to Army customers.

Products requested range from map and image datasets of small areas of interest to large country or command datasets. Customers are able to place requests through the AGC's website, by email or phone. CMB analysts receive requests from troops in preparation for deployment. Data can be delivered via CD-ROM, DVD or external hard drive.

Data available includes: CIB, Digital Terrain Elevation Data (DTED levels 0, 1, 2), Shuttle Radar Topography Mission (SRTM), shaded relief products created from DTED and SRTM as well as Indian Remote Sensing imagery (IRS – 5 meter color) of the entire United States. Products from the CMB database are in the native NGA RPF format.

A Common Access Card (CAC) is required to access the data from the AGC's public key interface (PKI) website, https://agcwfs.agc.army.mil/CMB_Online/default.aspx.

Customers are able to place requests through the AGC's website, by e-mail or phone. For more information about the AGC's Common Map Background program, please visit http://www.agc.army.mil/fact_sheet/CMB.pdf .

The U.S. Army Geospatial Center coordinates, integrates and synchronizes geospatial information requirements and standards across the Army, develops and fields geospatial enterprise-enabled systems and capabilities to the Army and Department of Defense as well as provides direct geospatial support and products to Warfighters. To learn more about the AGC, please visit www.agc.army.mil .

Visit these CMB Websites:

CMB Online: https://agcwfs.agc.army.mil/CMB_Online/default.aspx
UNCLASS: www.agc.army.mil/cmb
SIPRNet: www.agc.army.smil.mil/Products/CMB/index.cfm
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