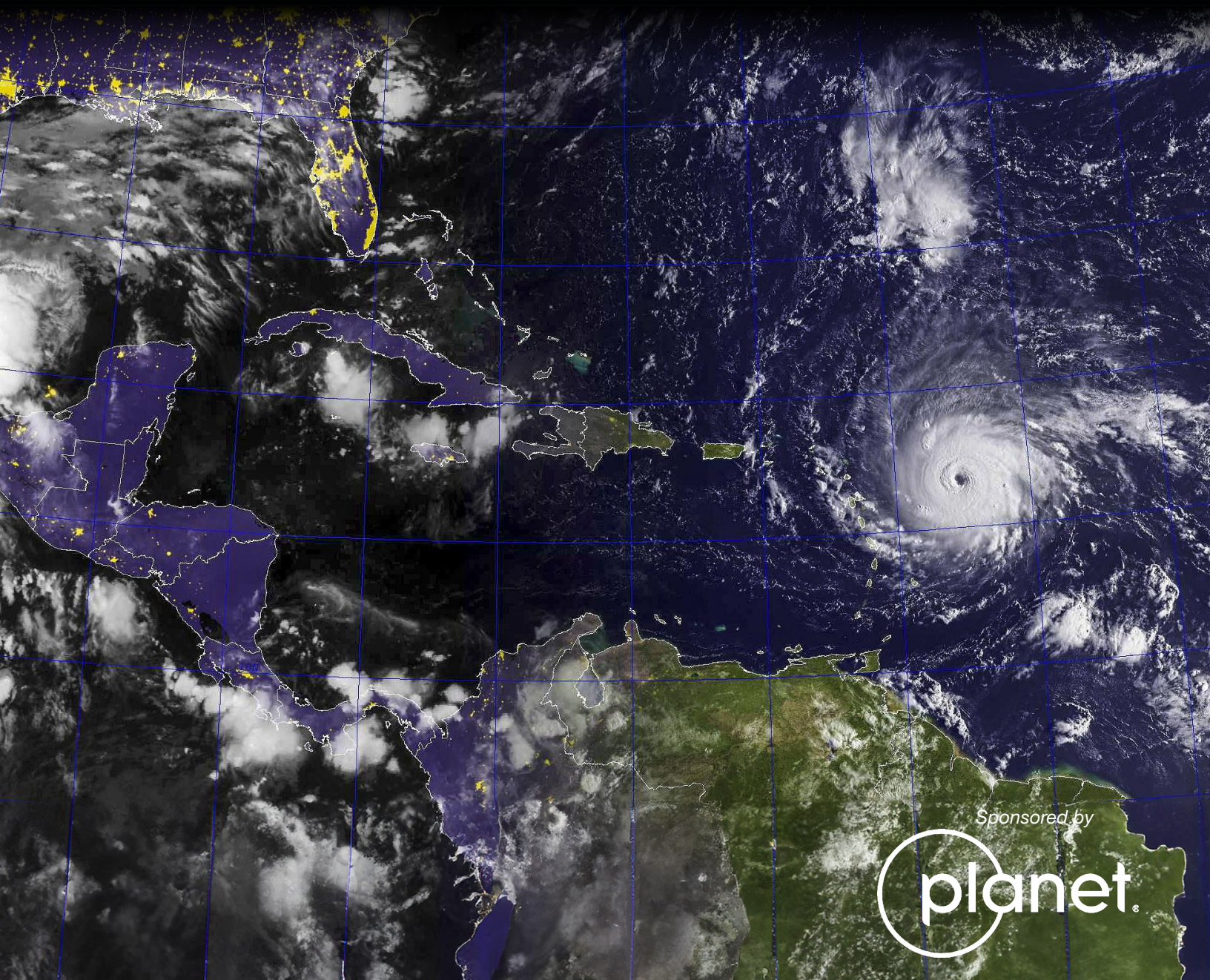
BREAKING DEFENSE

SPOTLIGHT:

How to "out-curious" military adversaries with Earth-sensing data



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How to "out-curious" military adversaries with Earth-sensing data

It's not just about what one image of Earth can reveal, it's about what a series of images through time in one location can tell you.

BY BARRY ROSENBERG, Technology & Special Projects Editor, Breaking Defense

There are multiple defining challenges today: connectivity between disparate networks, crewed-uncrewed teaming, and operations in contested environments to name a few. All vital, but the apogee may be how we handle data, especially in Earth observation and intelligence, surveillance, and reconnaissance.

Jason Bonci is the Department of the Air Force Chief Technology Officer in the Office of the Chief Information Officer.

"Earth sensing and other ISR capabilities [from] space or an aerial platform are incredibly important for situational awareness [to determine] the condition of our own facilities, adversarial movements, weather, [and] the broad spectrum of intelligence targeting," said Jay Bonci, chief technology officer in the Air Force Office of the Chief Information Officer. "We rely heavily on both national and commercial assets to make sense of the globe in as real-time as we possibly can.

Planet's satellites capture a military field camp taking shape in Belarus, which analysts say housed the Wagner Group. The camp has since been dismantled following Wagner Group leader Yevgeny Prigozhin's death.

Images courtesy of Planet Labs PBC.

At the same time, these platforms and sensors are collecting a massive volume of data. Having an ability to get that into the hands of sense-makers and warfighters at high speed will be one of the defining challenges of the next decade, according to Bonci, especially as it seems that new ISR, communications, and national-security payloads are being lofted into low-Earth and higher orbits on a weekly basis, each adding to the proliferation of data.

The growth in data from all of these areas is so massive, in fact, that paradigm shifts that struck government and industry every 5-15 years now wash over them every 6-14 months, according to Alexis Bonnell, CIO and director of the Air Force Research Laboratory's Digital Capabilities Directorate, who noted that the pace of decision making has to be commensurate with the increase in available data.

Bonnell and Bonci both participated recently in a Breaking Defense webcast devoted to Earth sensing and data collection and how the application of artificial intelligence and machine

ON THE COVER: A satellite image shows the eye of Hurricane Irma, a Category 5 storm, in the Atlantic Ocean in 2017. (US Navy photo)

Alexis Bonnell, CIO and director, Digital Capabilities Directorate, Air Force Research Laboratory.

learning can make sense of the data. A key takeaway from that live webcast was that while the total quantity of data can be overwhelming, using and massaging it in the right fashion will help the Defense Department "out-curious" it's adversaries.

Putting the pieces on the chessboard

That means turning the corner on the way we typically wrangle data that is based on control, structure, and cleaning. One of those near-annual paradigm shifts that Bonnell mentioned is here now in the presence of cloud, application programming interfaces (APIs), AI and generative AI, quantum, and hypercomputation. The ability to exercise one's curiosity about data has changed irrevocably for the apparent betterment of decision making because of those enablers.

"Curiosity comes from being able to move from structured data to unstructured, and being able to ask questions that you didn't know to ask a couple years ago," Bonnell said. "What is interesting is not only this incredible breadth of information but also the cultural challenge we have to encourage, enable, and reduce the toil in exercising curiosity and asking questions.

"It sounds easy but government and any big organization is good at beating the curiosity out of you and putting toil in. It's exciting now to have these new tools to inspire and drive our teams."

The availability of petabytes of imagery data and the tools such as cloud computing to work across a huge data fabric makes it possible now to refine data into intelligence from which decisions can be made.

"Whether you're looking for ships in the ocean, troop movements or potential targets, or understanding over time patterns of erosion or road conditions, it is a big data problem," said Bonci. "It requires not only the assets in the sky and the commercial relationships being able to access those, but the cloud computing, scale, and network transport necessary [for] sensors and processing.

"To get there culturally you need to instill the values of curiosity into your tech offerings so there are bridge tools available [to use] without an onerous process [so] we empower app writers, analysts, and intelligence folks to get their hands and collaborate on data. That will increase the velocity of [experimenting] around and leading to something."

That process is akin to "putting all the pieces on the chessboard so [they're] accessible," according to Bonnell.

Finding the needle in the haystack

On that chessboard, arguably the King piece is artificial intelligence. For companies that collect Earth observation data in the petabytes such as Planet Labs, their mechanisms for discovery and curiosity come from AI and machine learning to search and make sense of collected data.

Planet, for example, operates about 200 satellites that image all the land masses on Earth each day. It downlinks more than 30 terabytes of data every 24 hours of every spot on Earth and its full archive holds greater than 50 petabytes of data.

Jim Thomason, vice president, Imagery and Analytics for Planet.

"It's an amazingly rich resource that can be, as you can imagine, a challenge to filter through and search and find," said Jim Thomason, vice president of Imagery and Analytics for Planet. "The introduction of AI/ML gives customers a tool that can help them search through that archive and can find all the various needles in the haystack. You can find some bespoke thing in Planet's imagery today, and then go back through our 50 petabyte archive and find those patterns through time."

It's the AI models that make it possible to make sense of the globe in as real-time as possible. Say a mission planner wants to see imagery of how a particular dry dock facility in a certain maritime city has changed from day to day to day over a several week period. Having the ability to call up that data through the use of advanced algorithms can facilitate effective decision-making.

"The data can be even more useful when a provider can deliver information in a time series," observed Thomason. "Historically, satellite imagery has been about gleaning as much detail as you can from one image that you have. We now like to think in a time dimension, as well. It's not just about what I can tell you about this one image, it's about what I can tell you about this series of images through time in that one location."

For deployed warfighters, in particular, this gives them awareness anywhere in the world and much-needed visibility into the theater where they're operating. They can't have dated information; it needs to be the freshest available.

At the same time, such open-source imagery data can also be shared with mission partners in a way that they can't with their national assets so that everyone is working from a common playbook.