ShipView Simplifies Tracking of Global Shipping

User-Friendly Software Service Maps Big Data Quickly via Web

By Graham Stickler

There is no disputing that the world's waters are busy. On any given day, they support the weight of thousands of small boats, container ships, passenger liners, tankers and cargo ships, providing vital, fluid transit corridors that rival the busiest road networks. In the commercial trade arena, the oceans are unrivaled—according to the International Maritime Organization (IMO), more than 90 percent of global trade is carried by sea, and the amount of cargo transported by sea reached 8.4 billion tons in 2010.

Shipping is indeed the anchor of the global economy, without which the majority of the world's stores would be empty. However, all of this vessel traffic against the backdrop of vast, open waters presents sizable navigation, monitoring and tracking challenges. Knowing who is on the water at any given time and where they are headed is essential to maritime safety, yet it is one of the most challenging questions to answer with certainty.

That critical situational awareness—the who, what, where and when on the water—is what exactEarth's (Cambridge, Canada) exactAIS information provides. An information anchor for the marine environment, exactAIS receives and delivers in near-real time (NRT) global AIS messages to customers via a secure Internet link, providing an unparalleled, global view of the maritime picture at any given time, for any given area of ocean.

exactEarth has been delivering to its customers an unrivalled view of the maritime domain for years, but it is in the delivery methods themselves that exactEarth began to see a need for change.

### Critical Technology for Maritime Domain Awareness

The exactView system utilizes a patented algorithm for detecting AIS messages in orbit, even from the densest shipping areas of the world. This proven technology offers a complete NRT picture when it comes to understanding global maritime traffic movements. For many years, the exactEarth satellite constellation (currently comprising eight polar-orbiting satellites) has been the premier source of global coverage of vessel positions, routes and traffic for commercial and government customers alike; with numerous observations per day of any given point on the Earth.

AIS messages are complex and multifaceted, containing an abundance of information about a vessel, including position, speed, course, rate of turn, etc. In addition, on any given complete satellite pass of the exactEarth constellation, around 100,000 messages can be received, and it is only with exactEarth's technology that not only can the data make sense in an extremely quick manner, but the data can also be delivered securely to customers, allowing for the creation of their essential NRT operating pictures. This big data management highlights the clarity exactEarth brings to global AIS data, so that the data can be rapidly and easily consumed by authorities worldwide.

Satellite AIS Data on Demand

As much as satellite AIS data has buoyed safe navigation and authorities' maritime domain awareness, the detail of those AIS messages, their frequency and their formats have presented data management and interoperability challenges for customers. In particular, the specialized, multimessage structure of satellite AIS data has made it difficult for users to easily share and integrate this NRT data with other GIS and geospatial tools, not because it is text-based, but because it is a complicated multimessage structure that is not human-readable and requires specialist software to decode. That lack of data interoperability has moored the inherent value of AIS data to the confines of specialized information systems, inhibiting users' abilities to leverage this maritime intelligence to plot new innovations, make useful connections and make more informed business decisions.

To transform its satellite AIS data into an integral and actionable beacon of marine intelligence, exactEarth created exactAIS Geospatial Web Services (GWS), a customizable, on-demand data distribution model that allows users to easily access and integrate NRT ship information into existing Open Geospatial Consortium (OGC) compliant geospatial platforms, such as Esri's (Redlands, California) ArcGIS and Google Earth. GWS transforms the data into a single message structure that is human-readable, delivered in standard formats that do not require specialist software to read, and can be visualized on a map. An OGC-certified solution, GWS synthesizes and transforms text-based AIS messages into spa-
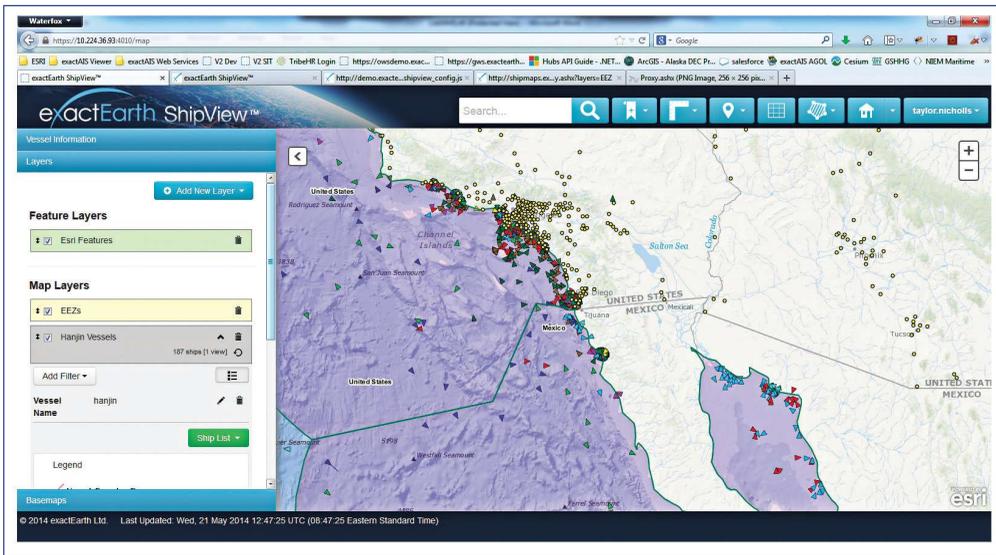
(Top) ShipView allows users to add external map layers from any OGC WMS or Esri ArcGIS server, such as NOAA Wave Heights, exactAIS Density Maps or Economic Exclusion Zones. (Bottom) Tracking ships is easier than ever before. Using the time slider, users can look back up to 90 days.

tial-ready, ship-centric information. Functioning like a vessel information drive-thru, users access the GWS through their existing geospatial platform, choose specific data sets on offer, such as the latest vessel information, historical track information or ship density maps, and GWS then delivers the files for immediate consumption. As GWS is supported with OGC filtering, customers can also dynamically customize the data based on geography, time and AIS message attributes, ensuring they only receive the exact vessel-voyage data they need. Those visual and temporal tracks can then be viewed on a map or retrieved on demand. It is targeted exactAIS data how and when users want it, without the need for specialist software, sophisticated databases and maritime analytical systems.

New Porthole Into Global Shipping

Stemming from the need to quickly build a picture of the world's shipping activity, exactEarth launched ShipView in the summer of 2014. This Web-based tool provides users access to all of exactEarth's GWS shipping data in a simple-to-navigate viewing platform. At its core, ShipView is built around the idea that dynamic geospatial data are best visualized on a map, as opposed to trying to make sense of multiple rows of data in a report or spreadsheet. Plotting the compre-

hensive satellite AIS data on a set of familiar map layers and granting access through any Web browser, ShipView offers a simplified user experience for daily monitoring of any number of ships anywhere in the oceans.

The platform follows the Software as a Service (SaaS) model, as exactEarth hosts the entire application and all the data; choosing a Web browser is the only responsibility for the customer. The need for exactEarth to take on the majority of the heavy lifting internally was quite obvious after the discovery that not everyone could cope with the ever-increasing levels of data being delivered. In fact, it seemed as if the company was sometimes actually creating data problems for users in the process of providing information solutions. Implementing an SaaS model addresses this, as exactEarth takes on the responsibility of not only hosting the data and the big data processing, but also providing access through a very simple, user-friendly platform.

One of the challenges of Web application development is how to provide a seamless and fast user experience. When exactEarth first started developing ShipView their development practice was to program features and functionality and expose the application to beta test users using standard Web server technology. They quickly found that the scope and size

of the application and related components made loading the application into a user's Web browser slow due to a technical browser limitation. This was good feedback in the early days and presented a big challenge to overcome to deliver a product and service level that their customers had come to expect. In the end, exactEarth implemented Web application optimization processes to precompile and bundle the ShipView application into one single file, which loads virtually instantaneously within a user's Web browser. Since this streamlining was achieved, ShipView users have experienced seamless and fast access to global maritime domain information and ship tracking.

With more than 150 customers worldwide are already using the ShipView platform exactEarth is confident that users are embracing it because it offers a unique simplicity when dealing with very complex data. ShipView requires no integration or upgrades with existing systems, and, along with a familiar set of map layers and navigation tools, the platform is out-of-the-box ready to help authorities around the world build a full operating picture for maritime domain awareness.

ShipView: A Technical Look

exactEarth ShipView allows users to see the ship positions produced by their exactAIS data service and plots them on a familiar set of map layers to enhance the viewing experience. As a hosted Web application, users can access ShipView from anywhere, anytime and on any mobile device to quickly view all maritime traffic. With a rich set of filtering and analysis tools, ShipView allows for maritime operational decisions to be made easier than ever before.

ShipView provides customers with the ultimate in data access by plotting the latest ship positions and instantly displaying pertinent ship information, including access to 90 days of historical track data for each ship and its picture from the extensive built-in ship photo database. These data improve maritime monitoring of ship activity, providing dynamic and up-to-date vessel data activity with longer look-back periods.

ShipView is built with a robust filtering capability that allows users to fine tune their searches to retrieve only the ships that meet their specified criteria to complete analysis quickly and gain situational awareness more efficiently. Familiar tools like bookmarks, a gazetteer

of the world's bodies of water and single-line searching make it very easy for customers to get started with ShipView immediately.

Customers can also enjoy a tremendous level of customization available within ShipView. Adding external map layers, such as those from the OGC or ArcGIS, is extremely easy and provides users with complete interoperability and extensiveness of data. Sharing ShipView information within an organization is also a key feature, with the ability to download and save information to improve off-line review and allow for loading of information into customers' existing software or databases.

Conclusion

ShipView provides a full featured platform to enhance maritime domain monitoring, ship tracking, and interoperability with external GIS data sources and applications. The ability to create custom views based on simple or complex rules and filters quickly enhances situational awareness and improves the decision-making process. Further, ShipView offers 90-day look-back for historical information, which helps users to better understand traffic patterns and behaviors. exactEarth employs multiple techniques to improve overall data quality, including erroneous position filter, historical spike removal, and ship information verification to create the most accurate and comprehensive view into maritime activities, as opposed to simply relaying standard AIS broadcasts.

ShipView was designed with four major factors in mind: speed, flexibility, interoperability and global support. These pillars are what make ShipView such a unique and important tool for performing complex marine activities. Maritime operational staff are faced with critical decisions daily and it is imperative that they receive and can query the most accurate and comprehensive shipping data available, not only quickly, but also in a way that is easy to consume and readily understood. ∎

Graham Stickler has been involved in the geospatial industry for 30 years, having worked around the world in both the public and private sectors designing, building and implementing geospatial-based solutions. He is currently vice president of product management at exactEarth, based in Cambridge, Ontario, Canada, where he has been for the last three years.