

# Improving Survey Efficiency through Real-Time Survey Visualization

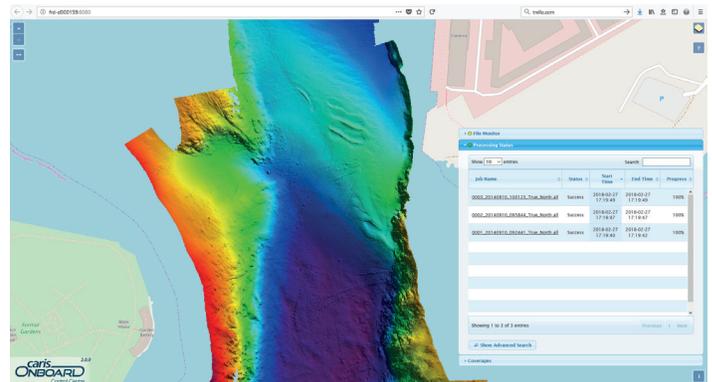
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## Introduction

In the ocean mapping industry there is a common trend to have fewer people on the vessel. This presents many clear benefits such as cutting costs and reducing safety risks, as well as improving quality of life for the surveyors by reducing time offshore and away from home. Since data processors do not have a need to be hands-on with the survey equipment, it makes sense to begin with migrating data processing to shore.

However, this migration-to-shore based data processing is made difficult by communication restrictions between offshore vessels and a shore based office. While transferring all of the raw data from the vessel may be feasible in theory, for most operations it is cost prohibitive. Dependent on the bandwidth available and volume of sensor data being logged, the time to transfer the data can easily surpass the time taken to acquire the data, causing processing efforts to quickly fall behind. In a worst case scenario there may be no communications available, so the data would not become available until it can be hand carried to the office.

When considering the key role processed data plays in supporting effective and efficient management of a survey operation, any significant delay between the acquisition and processing of data is immediately detrimental. Having all sensors integrated into a processed product allows operators to monitor that survey requirements are being met, and the overall coverage is in line with the operational plan. A delay in data processing would risk prolonged collection of poor quality data, or areas in need of further investigation or re-survey may require significant transit time to be spent returning to a survey site.



» CARIS Onboard 2.0 Control Centre is opened in a web browser. It is focused on a web-map which provides real-time survey visualization, in addition to the tools for controlling data processing.

In order to process data automatically on the vessel and to provide information about survey operations in real-time on the shore, the high volume raw data must be reduced to information products which are small enough to be easily shared over a low bandwidth connection. Teledyne CARIS recently released CARIS Onboard™ 2.0 with this exact goal in mind. Running on the survey vessel, CARIS Onboard automatically processes the raw sonar data, along with positioning, motion, tidal and sound velocity data, and generates a processed surface.

## Software Demonstration

During the Oceanology International exhibition and conference held in March of 2018 in London, the concept of real-time survey visualization was demonstrated by Teledyne CARIS using the latest release of CARIS Onboard.

Braveheart Marine's vessel "Patriot" was used for the demonstration. The Patriot was equipped with survey equipment from Teledyne Marine, including the T50-R multibeam and the rapidCAST for underway sound velocity profiling. The data was acquired through Teledyne PDS.



» Braveheart Marine's vessel "Patriot" was used to run the demos during OI18.



» Image aboard the Patriot, showing Teledyne PDS controlling the sonar in the top screen, and CARIS Onboard displaying the automatically processed surface on the bottom screen. This demonstrates how the processed data can be used on the vessel to guide the hydrographer without distracting from running the survey equipment.

This surface provides information about the survey's quality and coverage. The bandwidth requirements are further reduced as CARIS Onboard converts the surface into tiled images in the Portable Network Graphics (PNG) format, and live streams the images into a web map to be opened in any networked device which can connect to the vessel. By providing access to processed products in a web application, CARIS Onboard allows the dataset to be automatically processed on the vessel to a point where low bandwidth information can be streamed to shore, providing real-time survey visualization in support of efficiently managing a survey.

CARIS Onboard 2.0 was installed on the Patriot, and setup to read the raw data files produced by PDS. Once set to run by the remote data processor, the software automatically processed the raw sonar data according to a pre-defined workflow designed by the data processor. In this case the data was imported to a HIPS project, then Georeferenced while applying corrections for water levels and sound velocity variations in the water column,

Total Propagated Uncertainty (TPU) calculated, data filters applied, and finally a processed bathymetric surface was calculated from the data.

A low cost laptop was setup at the CARIS booth in the exhibition hall and connected to the vessel, using a standard 3G cellular data modem connected to the laptop, with a second modem on the vessel. For the duration of the three day event, CARIS Onboard automatically processed and live-streamed the data to the web map embedded in CARIS Onboard's new Control Centre. The processed surface was displayed in near real-time at the booth on a large monitor.



By monitoring the 3G modem during the demonstration, it was recorded that less than 1GB of data was transferred from the vessel for the duration of the 3 day conference. The transfer rates peaked at approximately 1 Mbps, however dependent on the location of the vessel, they were as low as 150Kbps, demonstrating that even with

a low bandwidth connection, CARIS Onboard was able to provide real-time survey visualization.

## Conclusion

The demonstration at Oceanology International successfully showed that by using the commercially available software, CARIS Onboard 2.0, it is now possible to provide remote real-time survey visualization with a low bandwidth connection when operating close to shore. With the data processor positioned on shore, the data can still be processed, and information products made available for supporting the efficient management of survey operations.

## About the Author

Travis Hamilton has been with Teledyne CARIS since 2015 and is the Product Manager for CARIS Onboard and HIPS and SIPS. Prior to this, he spent several years working in research and industry, gaining experience with the operation of, and processing data from, AUVs, subsea positioning systems and swath sonar systems.