

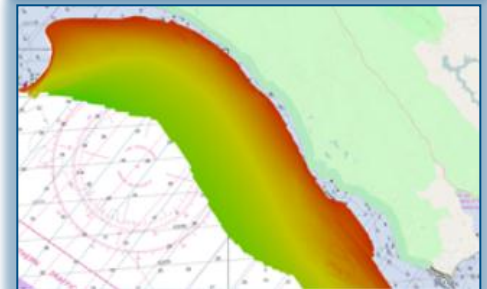
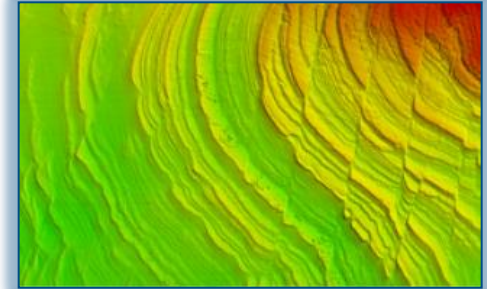
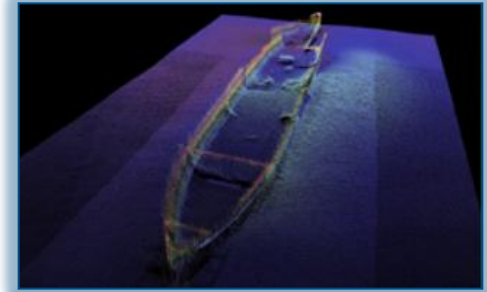
Implementing the S-100 Standard and Product Specifications

14th North Indian Ocean Hydrographic Commission (NIOHC) Conference
26 – 28 February 2014
Hydrographic Department, Royal Thai Navy (HDRTN), Bangkok, Thailand

Presented By: Matt Holland, Deputy Marketing and Sales Manager, CARIS

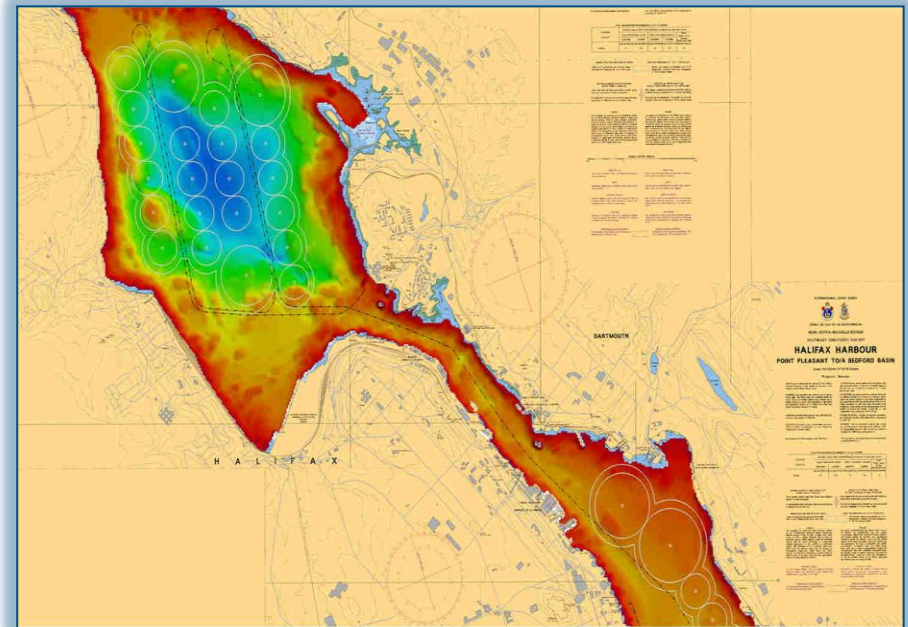
- Introduction
- Implementing S-100
 - Universal Hydrographic Data Model and Technical Advantages
 - S-101 ENC
 - Updated Data Model and Test Platform
 - S-101 Migration from S-57 ENC
 - S-102 Bathymetric Surface Product
 - Workshops and the Blue Economy
- Other industry trends
- Education and capacity building

- 35 years developing commercial GIS solutions
 - Specialized focus on GIS for the maritime community
- Use international standards and participate in related working groups:
 - ISO/TC211 , IHO TSMAD, IEHG, OGC, MSDIWG
- History of offering GIS for standards based digital hydrographic data
 - S-57 ENC, IENC, AML and MIOs, and VPF DNC / Vmap products

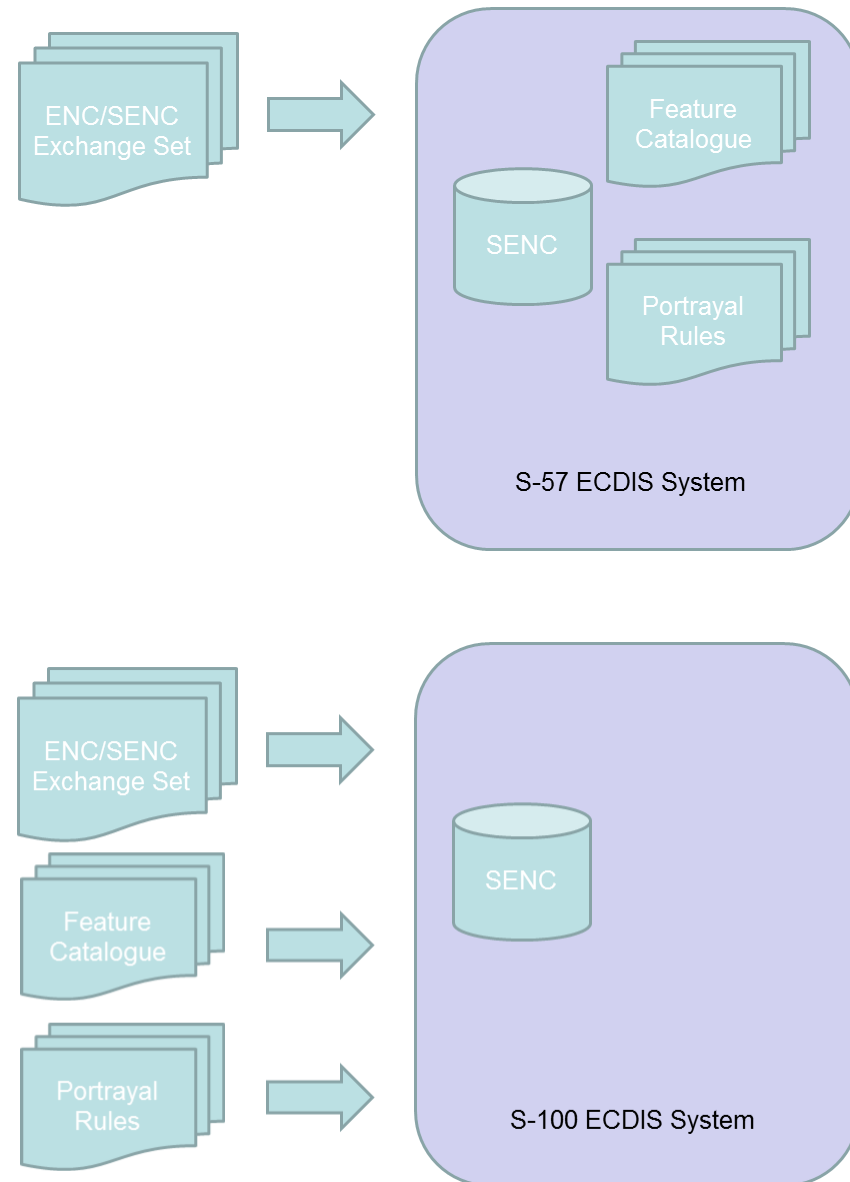




- IHO S-100
 - Edition 1.0.0 – January 2010
 - Based on ISO/TC211 standards
 - Interoperable with other ISO 19100 based profiles
 - Increased use of marine spatial information
- Product specs. under S-100
 - S-101 ENC
 - S-102 Bathymetric Surface Product
 - S-121 Maritime Limits and Boundaries
 - S-124 Navigational Warnings
 - S-401 Inland ENC
 - S-xyz ...

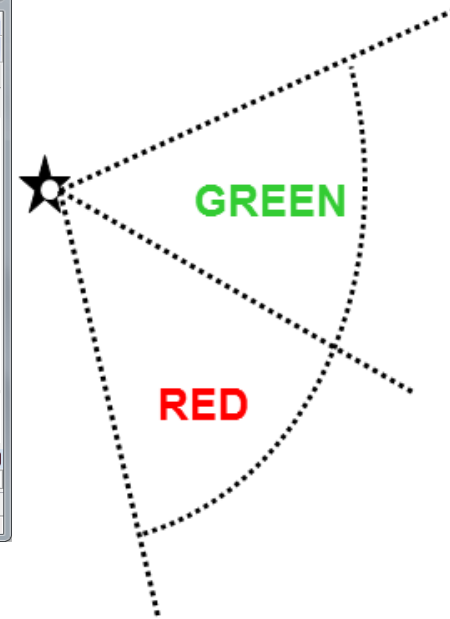
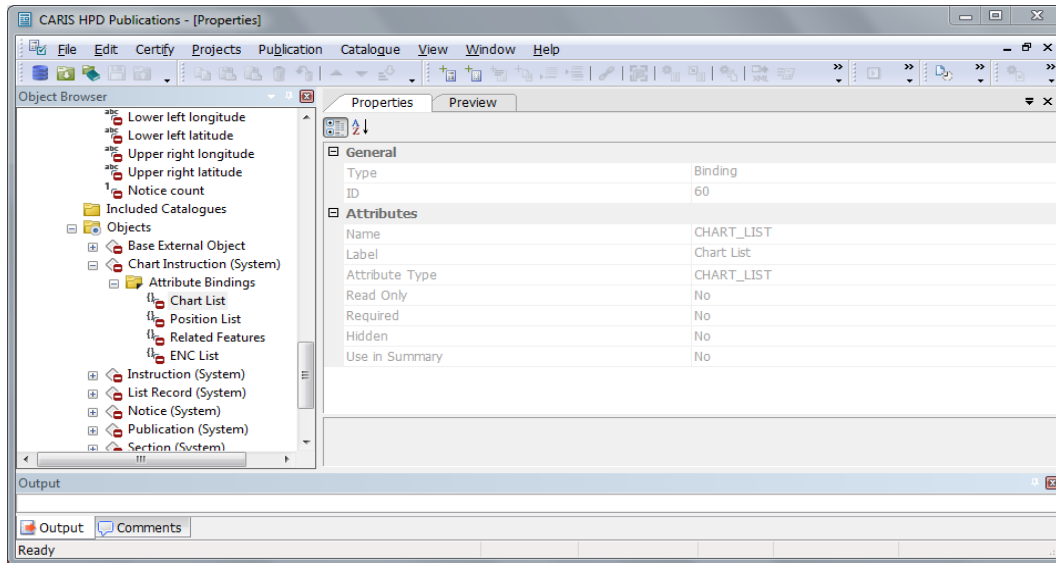


- Data model is not embedded in the encapsulation of products
 - Content and carrier are independent
- Product feature catalogues are flexible to support expansion
 - Support future IMO and e-Navigation requirements
- Feature and portrayal catalogues to be provided to S-100 ECDIS as data
 - Not programmed into ECDIS as with S-57
 - Allow ECDIS to dynamically handle new data



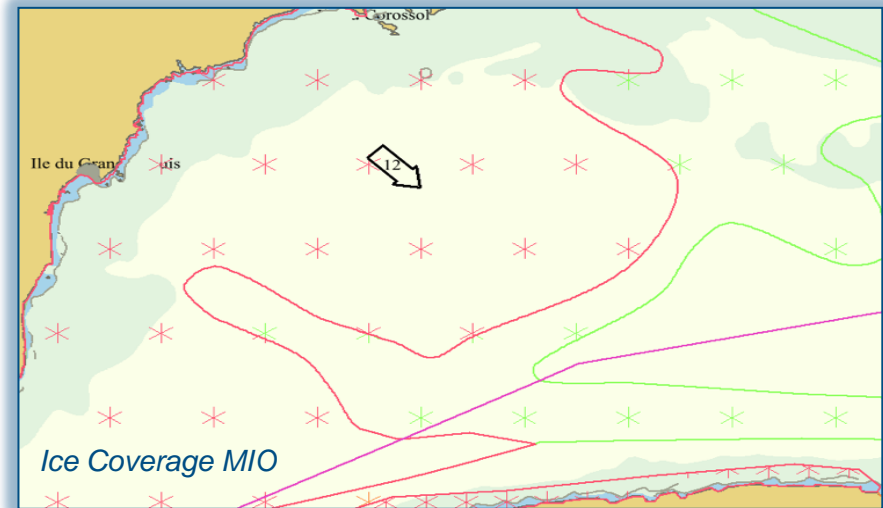
- IHO S-101 ENC
 - Draft – November 2013
 - S-57 ENC specs rewritten following S-100
 - “Cleaning up” of S-57 ENC product spec. and encoding guide
 - S-101 using new capabilities
 - Feature and attribute encoding
 - Extended metadata
 - Exchange of feature and portrayal catalogues
 - Encoding using ISO 8211 (also used by S-57 ENC)

- Data model updated to support new S-100 data types
 - Complex features and attributes, new relationships and metadata, etc.
 - Example:

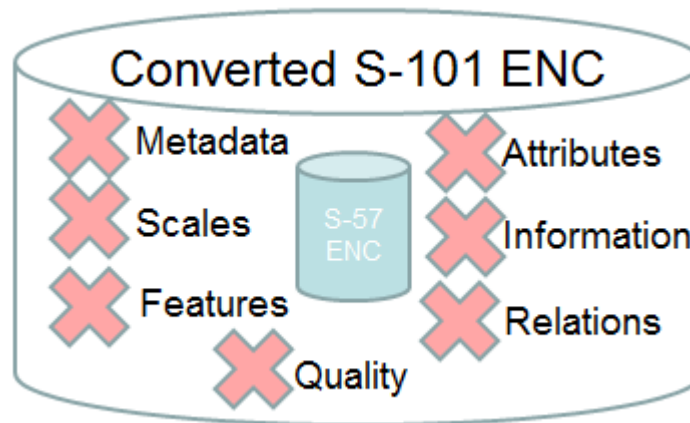


- S-57 requires multiple, separate features to model the above (e.g. one per light sector)
- S-100 allows all sectors of the light to be encoded on one object
 - CARIS solutions making use of new encoding

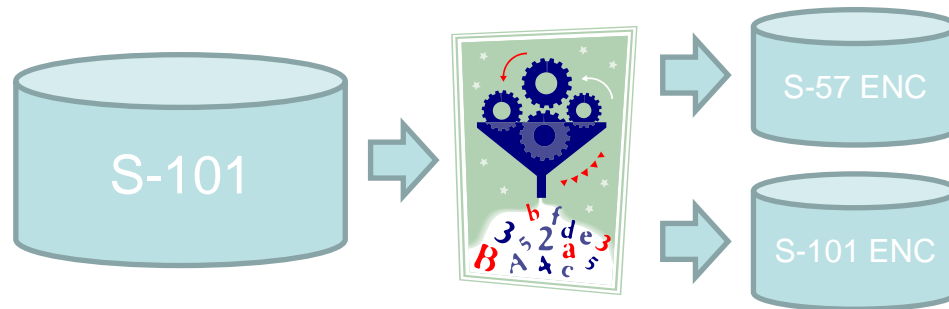
- Objective: provide industry with platform for creation of datasets based on S-100 products
- CARIS solutions to support creation of test datasets
 - Experience providing flexible solutions to create new/customized product types:
 - S-57 MIOs for ice coverage, restricted areas, etc.
 - Catalogue and format updates to support S-100 data
 - S-101 features, attributes and portrayal defined to date by TSMAD



- Concept of conversion introduced by TSMAD
 - Establish initial data for testing purposes
- S-101 is superset of S-57 ENC
 - New: features, attributes, metadata, scales of use, etc.
- Conversion of S-57 ENC into S-101 is partial solution
 - Auto converted S-101 from S-57 ENC will be the same data in new package

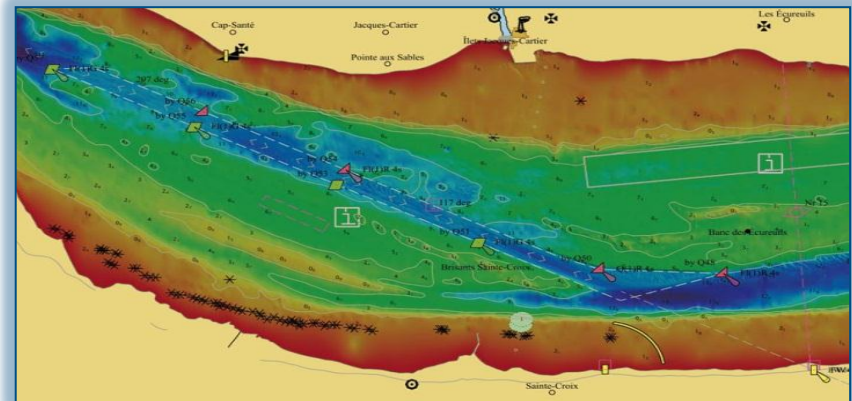


- Conversion of existing S-57 ENC into S-101 is first migration step
- Additional steps needed
 - Populate new information for S-101 ENCs
- Make one product and convert to the other, then produce S-101 and down sample to S-57 ENC
 - Populate source data with S-101 content
 - Support S-101 products but also S-57 ENCs, until market upgrades to S-100 ECDIS



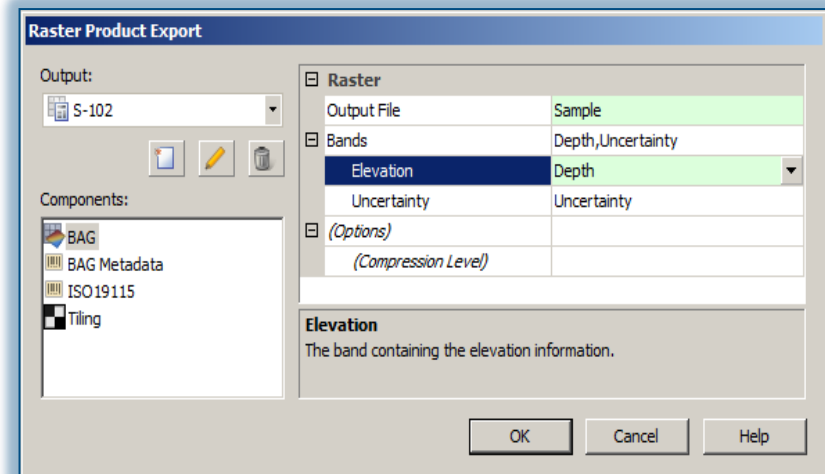
- IHO S-102 Bathymetric Surface Product
 - Alternate title: BAG – Bathymetric Attributed Grid
 - Edition 1.0.0 – April 2012
 - Alternative to contour and sounding feature products to depict seafloor
 - Gridded seafloor model for use with ECDIS/ECS
 - Compliment/enhance ENC information
 - Water level adjustments for situational awareness or planning
 - Encoding based on HDF5 (i.e. same as BAG)
 - Other possible encodings 32-bit GeoTIFF
 - Exchange with other stakeholders

Filtered ENC and S-102 in Background ¹



¹ Image: Marc Journault and Louis Maltais, Canadian Hydrographic Service and Ed Kuwalek, IIC Technologies Canada; The New IHO S-102 Standard; Hydro International, May 2012, Volume 16, number 3

- CARIS solutions used for S-102 prototyping²
 - Initiative lead by CHS, NAVO and industry partners
 - Bathymetry datasets integrated and compiled
 - Extracted to separate grids based on tiling scheme
 - Deliverables produced in BAG, GeoTIFF, etc.
- Additional work being done:
 - Tile set creation using decimal degrees (metres currently supported)
 - Produce S-102 Ed. 1.0 metadata profile
 - ISO 19115 / 19115-2 metadata profile already implemented
 - Changes to S-102 metadata profile ongoing



² Marc Journault and Louis Maltais, Canadian Hydrographic Service and Ed Kuwalek, IIC Technologies Canada; The New IHO S-102 Standard; Hydro International, May 2012, Volume 16, number 3

- S-100 Workshop for SEPHC
 - CARIS and Lee Alexander (UNH) engaged to deliver workshop
 - Delivered November 2013
 - First workshop to introduce S-100 and related product specs. to the region
- S-100 Workshop at CARIS 2014
 - Overview of S-100 data standards
 - S-100 data modelling and development of S-101 ENC production
 - Creation of S-102 Bathymetric Surface Products



Developing the Blue Economy

June 2-5, 2014 | Brest, France

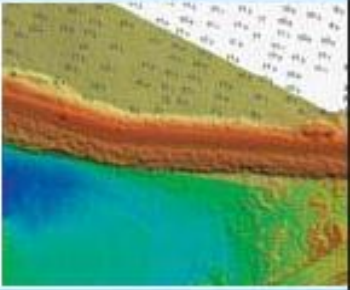
CARIS 2014
15th International User Group Conference

- Implementation of S-100 to increase marine spatial data interoperability
 - Increased/ease of use by other stakeholders
 - Coastal zone managers, fisheries depts., environmental scientists, etc.
 - Support the Blue Economy
 - Resource management and exploration
 - Habitat mapping and fisheries monitoring
 - Coastal engineering
 - Marine GIS to facilitate efficient transition/migration to new standards

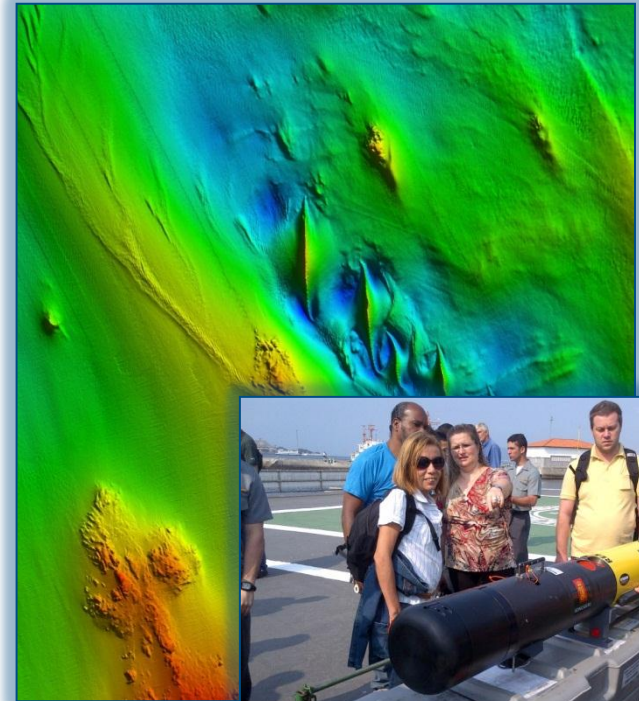


Developing the Blue Economy

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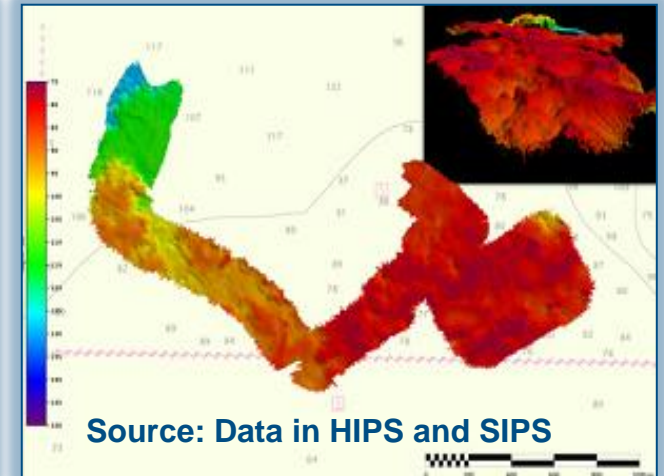


- Requirement for AUV surveys:
 - Batch process multibeam data onboard AUV
 - Convert data, apply corrections, create surface
 - Send compressed geo-ref image of surface to parent ship
 - Via existing communication lines
 - Modify AUV survey based on new seafloor knowledge



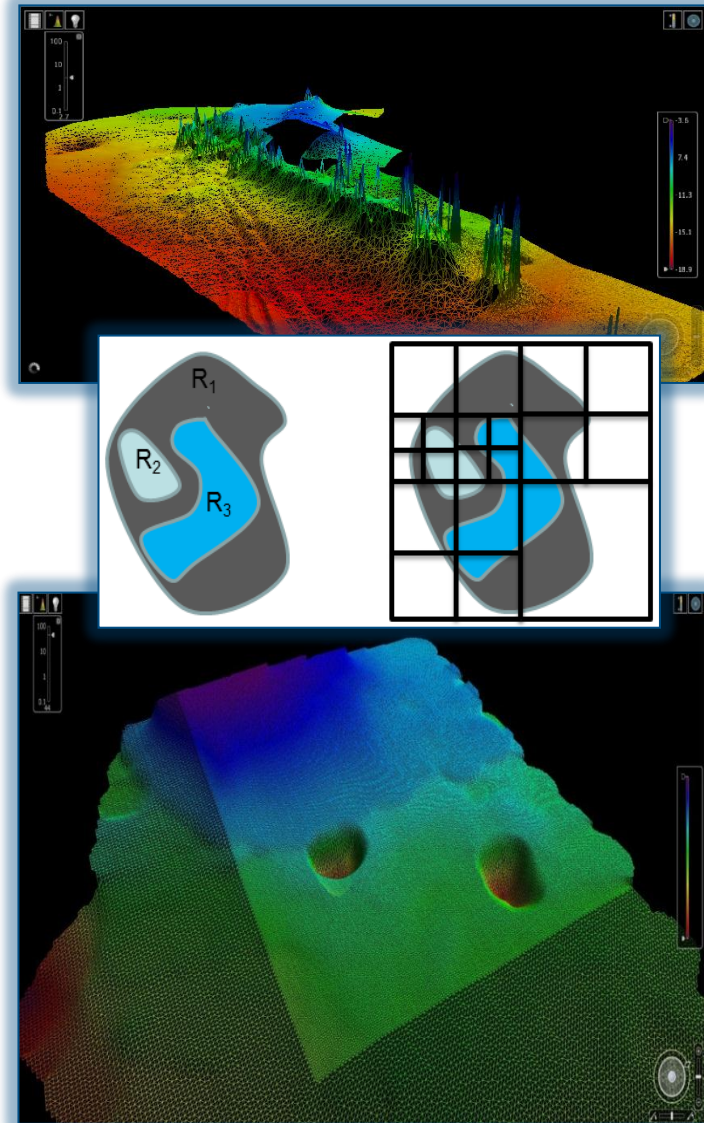
Source: Hydroid

- Autonomous data collection and processing
 - Onboard suite of HIPS and SIPS™ deployed on Liquid Robotics wave glider with Teledyne Odom multibeam
 - Collection of high resolution hydrographic data
 - Data automatically processed as collected
 - Data transmitted to shore for evaluation
- Provides shortened ping-to-chart time for cost effective operations



- Traditional methods for elevation models
 - Single resolution grid for consistent data density
 - TIN for irregular/varying resolution
- Challenges
 - Grid may not sufficiently model the area
 - TINs typically have large memory footprint
- Variable Resolution Surface
 - Resolution of single surface layer can vary
 - Allows multiple methods of resolution determination (e.g. CUBE V2 / CHRT ³)
 - Addresses varying resolution and high volume data storage challenges

³ <http://ccom.unh.edu/theme/data-processing/fishpac-lrss-sonar>





- Education by industry to adapt to technology trends and changes
 - Focused training on marine GIS used in production
 - Practical hydrographic training (e.g. IIC Academy)
- Education through capacity building
 - Paper chart training for Sri Lanka (2013)
 - HPD training for SWAtHC and SEPHC (2013)
 - ENC training for Myanmar and Bangladesh (2014)
 - MSDI workshops (5 since 2011)
- Academic institutes and partnerships
 - GIS solutions for educational programs
- Supplement by distance learning
 - Flexible scheduling and low cost
 - www.caris.com/elearning/

ENC Production
with CARIS S-57 Composer
FREE DEMONSTRATION COURSE

This is a free demonstration of the first part of the full ENC Production with CARIS S-57 Composer training course. It gives a basic idea of the content, appearance and the different types of media used in the complete course. No registration is required.

Enter

ENC Production
with CARIS S-57 Composer

This training course is designed to provide a basic understanding of how to use the [CARIS S-57 Composer](#) version 2.2.1 software product to create and update International Hydrographic Office (IHO) S-57 Electronic Navigational Charts (ENCs).

A valid licence of CARIS S-57 Composer version 2.2.1 software is strongly recommended in order to complete the training exercise portion of the course.

Information: [course description](#) and [course requirements](#).
Length: 24 hours (estimated - completion time may vary).
Cost: \$300 USD for 90 days access to the course - [registration information](#).

Register Login

Chart Production
with CARIS Paper Chart Composer

This training course is designed to provide a basic introduction to the use of the [CARIS Paper Chart Composer](#) software program to create nautical paper charts in a digital production environment.

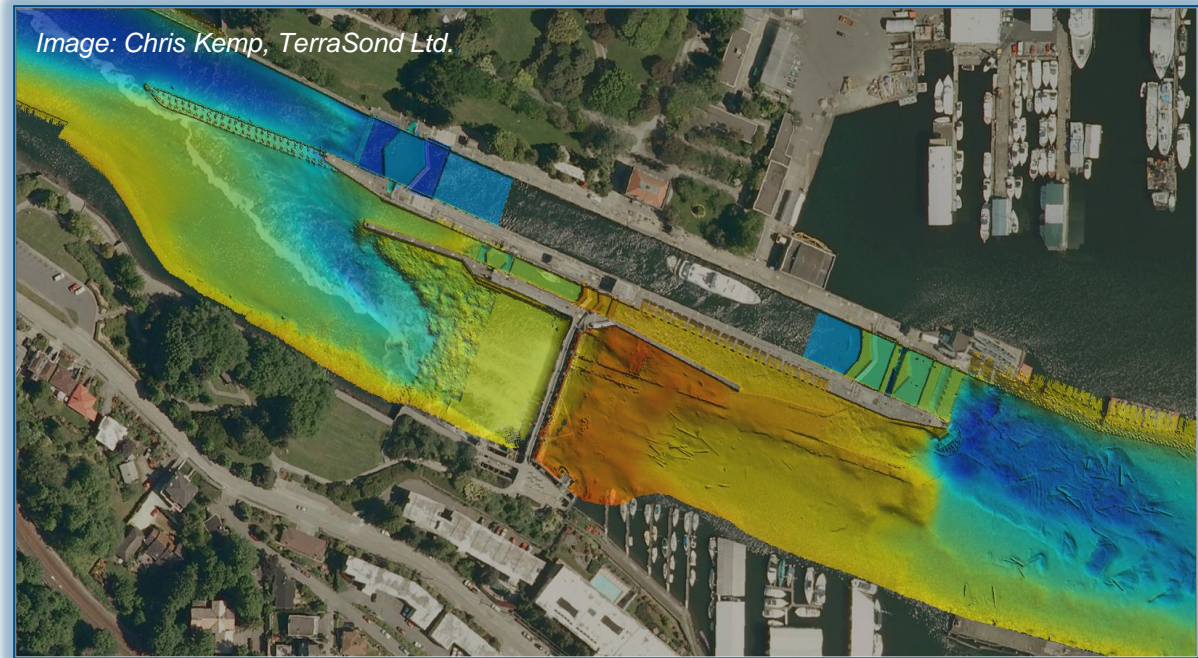
A valid licence of the CARIS Paper Chart Composer version 1.1 software is strongly recommended in order to complete the training exercise portion of the course.

Information: [course description](#) and [course requirements](#).
Length: 12 hours (estimated - completion time may vary).

Login

Thank You!

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