

Teledyne Geospatial

NIPWG10 13-Sept-2023

CARIS Software for NPubs Update



Topics

- Introduction to Teledyne Geospatial
- CARIS' S-100 development
 - Including S-101 and S-102 (and more)
- CARIS automation from ping to chart
 - Some of the many possibilities
- Multi-Fuel
- NPubs

Teledyne Geospatial

Introduction



Instrumentation



Digital Imaging



Aerospace & Defense Electronics



Engineered Systems

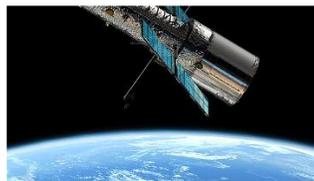
Teledyne Digital Imaging



Industrial / Machine Vision



Healthcare and Life Sciences



Aerospace and Defense



Geospatial



Scientific



MEMS

Geospatial

Imaging Solutions for Land and Water

Teledyne Geospatial CARIS Software



Discover the benefits to the maritime community 

Teledyne Geospatial Optech Lidar

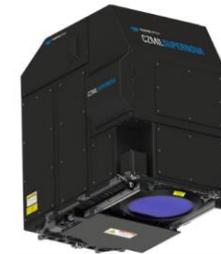


Vaughan, Ontario, CANADA – February 9, 2022 – Teledyne Geospatial, a Teledyne Technologies (NYSE:TDY) company, is pleased to announce that the next generation Optech CZMIL SuperNova topo/bathy lidar system has been awarded both the Geospatial Excellence Award for Technology Innovation and the Geospatial Excellence – Project of the Year Grand Award.

The Optech CZMIL SuperNova boasts the best depth performance and the highest green laser point density in its class. With SmartSpacing technology for even and efficient point spacing, real-time processing capability for reduced post-processing time and configurable modes for maximizing performance in different water environments, the SuperNova provides a wide range of inputs for climate change modelling and is ideal for inland water environments, base mapping for coastal zones and shoreline.

A true geospatial solution, the CZMIL SuperNova's workflow is integrated with CARIS Base Editor software for seamless data processing capability and built-in AI techniques for land/water classification.

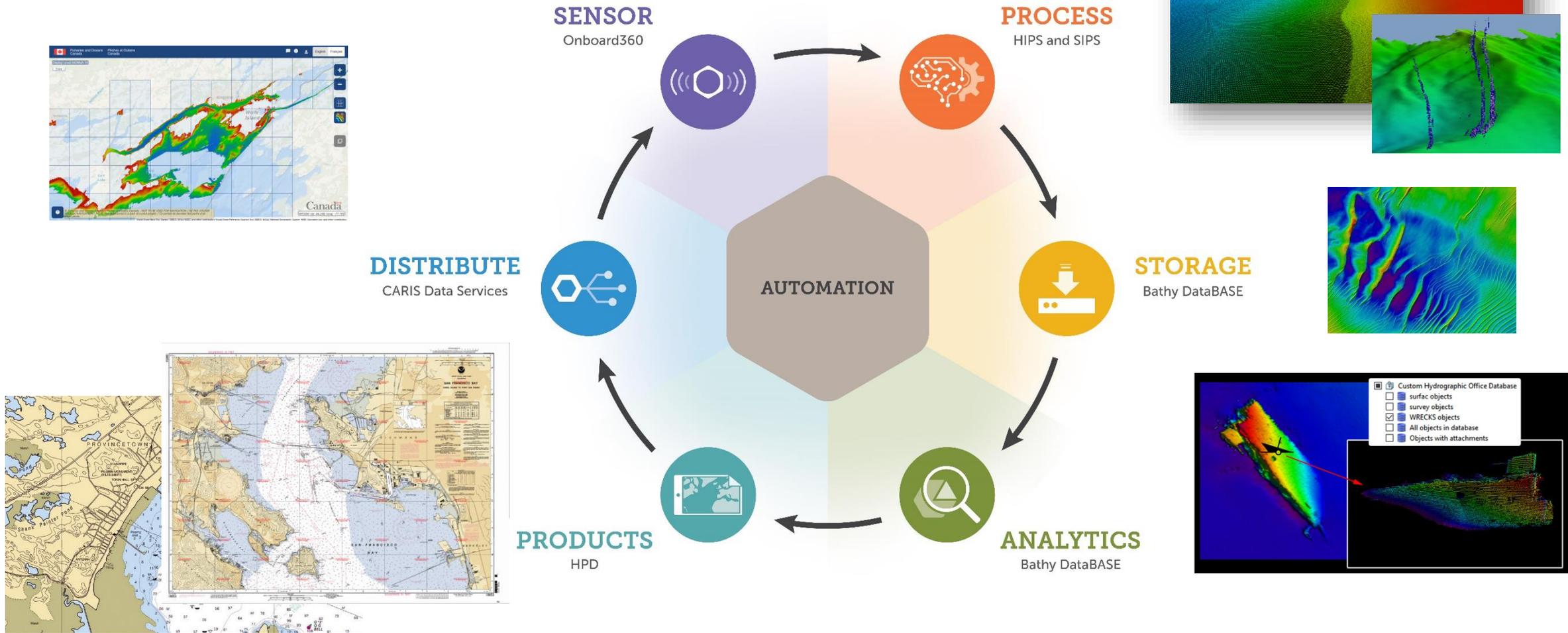
Teledyne Geospatial Director of Product Management Karen Cove comments, "We are thrilled to have the CZMIL SuperNova recognized by MAPPs and excited to see customers like Dewberry and Terratec tackle challenging projects with its demonstrated efficacy in environments like coastal beaches, inland waterways, coral reefs and deep-water mapping."



Award-winning next generation CZMIL SuperNova topo/bathy lidar

Teledyne CARIS

Ping-to-Chart Workflow



S-100 Development Update

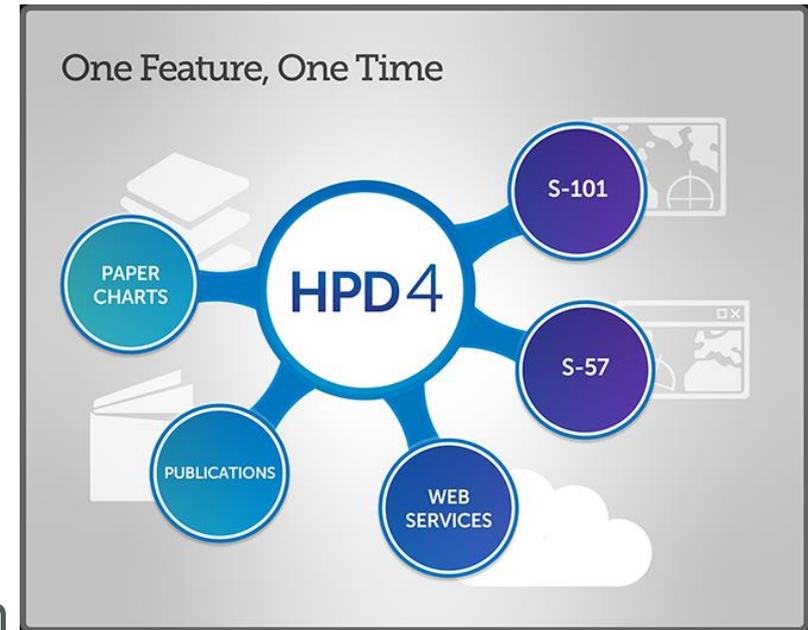
Including S-101 and S-102 (and more)

S-100 Products

S-XXX Support & Current Plans in CARIS Apps		
S-XXX #	Name	Edition #
S-101	Electronic Navigational Chart	1.1
S-102	Bathymetric Surface Product	2.0
S-104	Tidal Information for Surface Navigation	1.0
S-111	Surface currents	1.0
S-121	Maritime Limits and Boundaries	1.0
S-122	Marine Protected Areas	1.0
S-123	Radio Services	1.0
S-127	Marine Traffic Management	1.0
S-128	S-128 Catalogue of Nautical Products	Draft
S-129	Under Keel Clearance Management Product Specification	1.0
S-201	Aid to Navigation Information	1.0 Draft
S-401	Inland ENC	1.0
S-402	IEHG Bathymetric Inland ENC	1.0 Draft
S-411	Ice Information	Draft
NATO AML+	Additional Military Layers	Not defined

S-100 Module

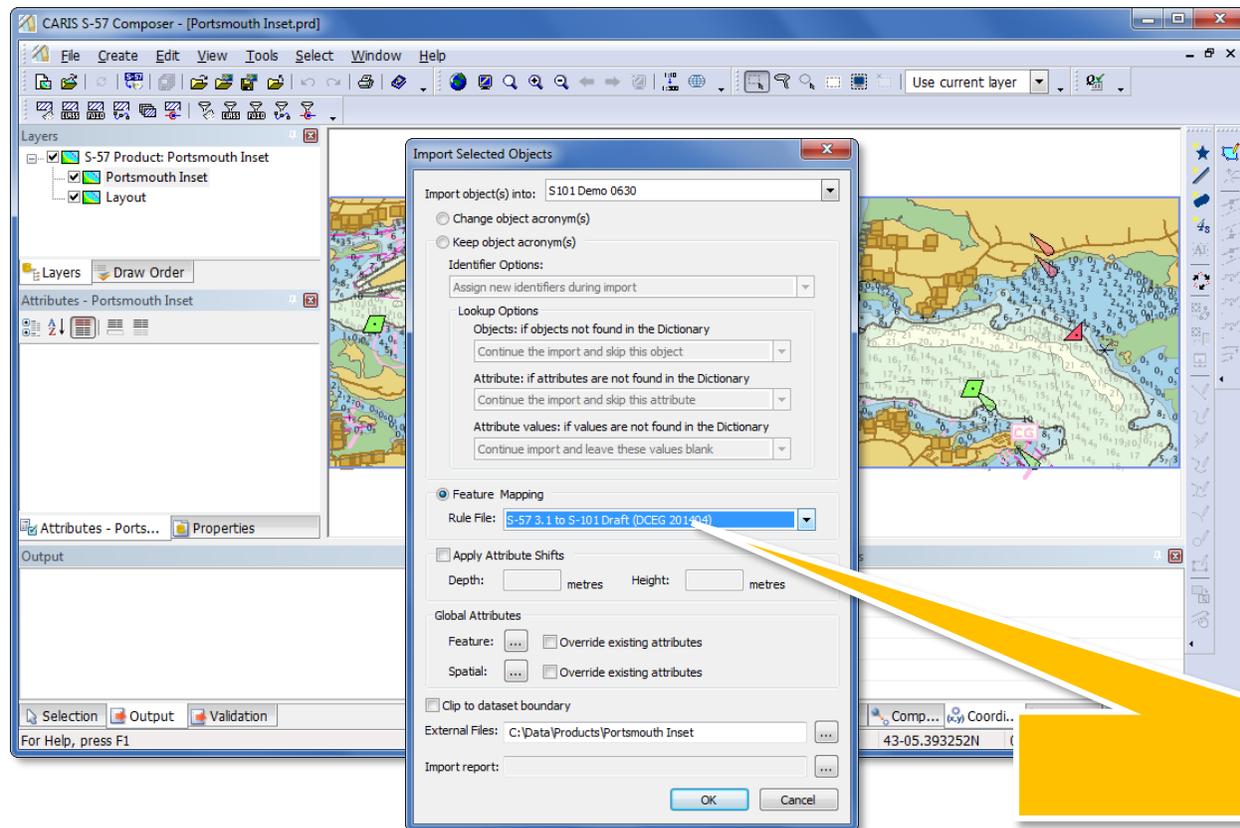
- Create and maintain S-100 vector features
 - Just as easy as S-57 features
- Convert S-57 ENC <-> S-101 ENC
 - Import and export with automated conversion
- Dual fuel S-57 & S-101 ENC production
 - Publish S-57 and S-101 ENCs without extra efforts
- Multi-fuel S-57, S-101, IENC, Npubs, AML. +



Open S-100 in all CARIS desktop applications

S-101 Production

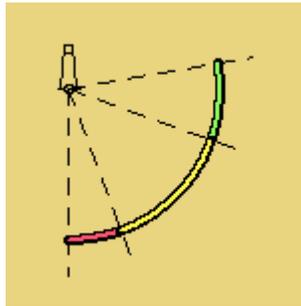
Automated or interactive S-57 to S-101 conversion
and S-101 to S-57



Mapping rules

Each light sector is a feature in S-57 ENC

S-57 ENC



S-101 ENC

One "complex" feature in S-101

Selection

Feature ID	Acronym
1C 000000...	LIGHTS
1C 000000...	LIGHTS
1C 000000...	LIGHTS

Attributes repeated for each feature

Sector limit one	
Sector limit two	340
Signal group	(1)
Signal period	3
Signal sequence	
Status	
Value of nominal range	6
Vertical datum	

Selection

Feature ID	Acronym
1C 000000...	LightSectored

Attributes - LightSectored

Light characteristic	7 (isophased)
Light sector 1	1 (white),290.000000000
Light sector 2	3 (red),340.000000000
Light sector 3	4 (green),260.000000000
(New Light sect	
Signal group 1	(1)
(New Signal group	

Light sectors attributes

Topmark is a separate feature in S-57 ENC

S-57 ENC



Selection

Feature ID	Acronym
1C 000005...	TOPMAR
1C 000005...	BCNISD

Attributes - TOPMAR

Topmark/daymark shape	4 (2 spheres)
Scale minimum	20000
Colour	2 (black)
Colour pattern	
Status	
Vertical length	
Textual description in nation:	
Pictorial representation	

S-101 ENC

One "complex" feature in S-101

Selection

Feature ID	Acronym
1C 000000...	BeaconIsolatedDanger

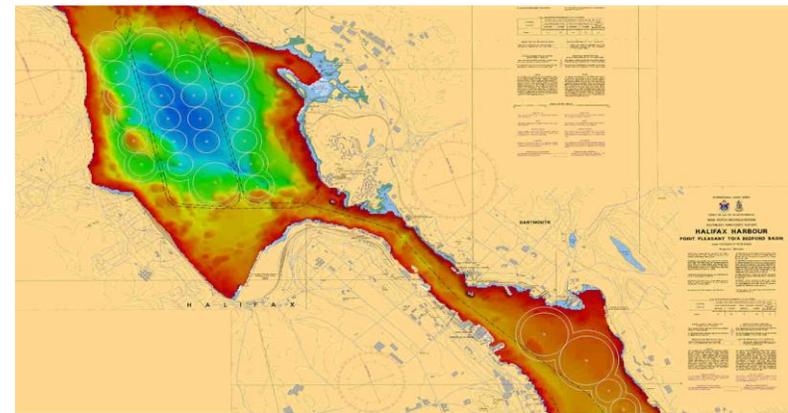
Attributes - BeaconIsolatedDanger

(New Periodic date range 1)	
Radar conspicuous	
Reported date	
(New Status 1)	
Topmark	2 (black),4 (2 spheres)
Vertical length	
Visually conspicuous	

Topmark is an attribute

S-102 Bathymetric Surface Product

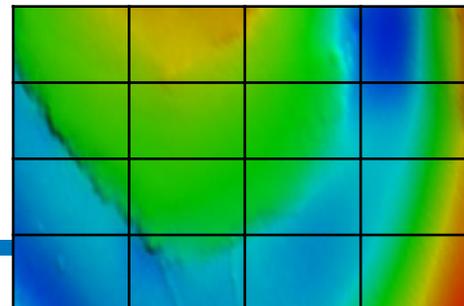
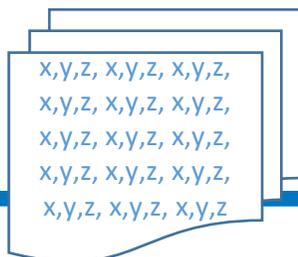
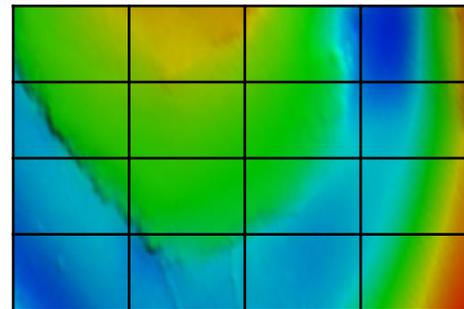
- Growing interest for enhanced navigation e.g. in
 - High risk areas
 - Environmentally sensitive areas
 - High traffic areas



CARIS Bathymetry DataBASE / CARIS BASE Editor

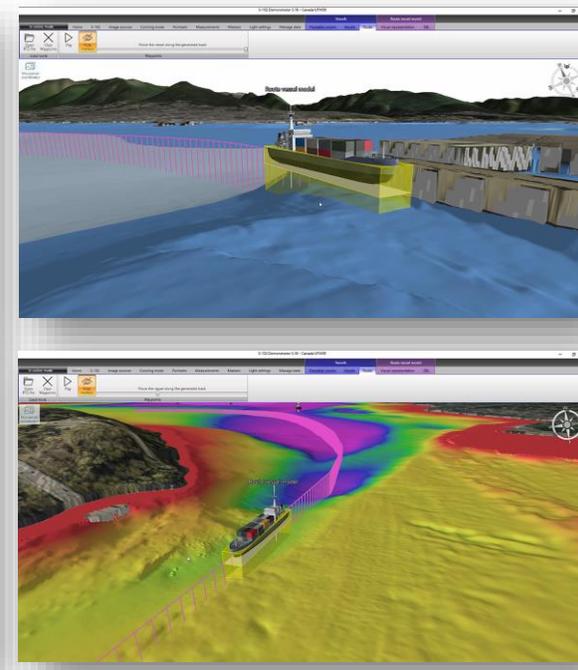
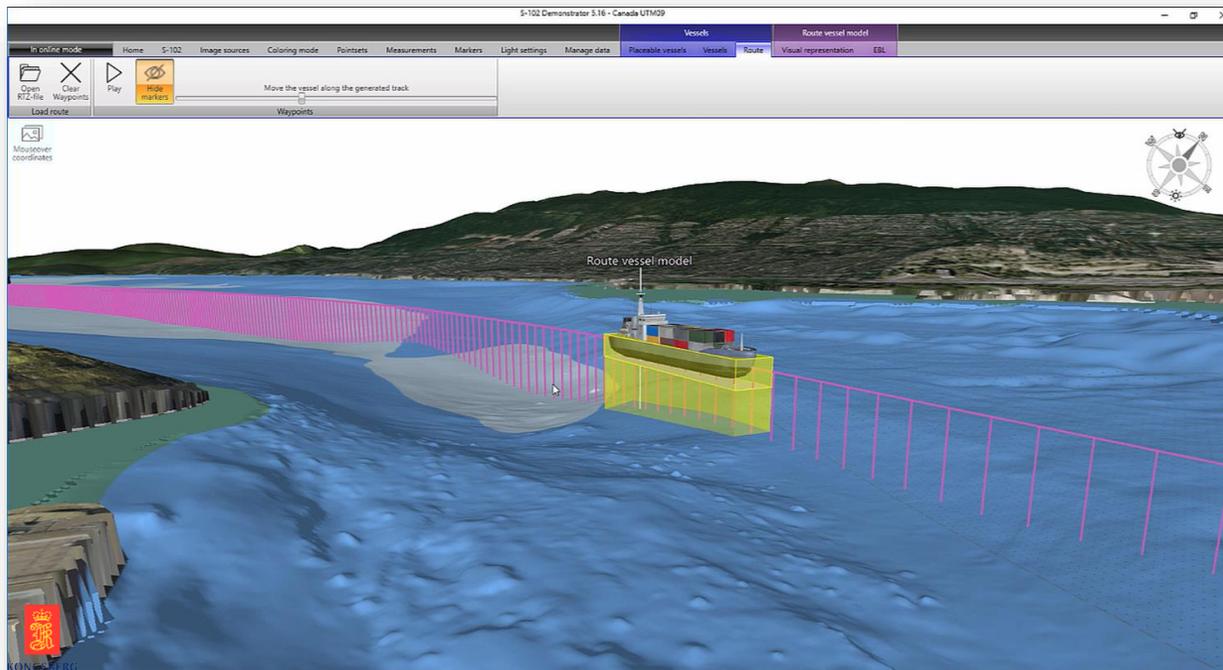
S-102 products

- Easy and quick S-102 production
 - Simple steps combines surveys and combine these into S-102 products
 - Can also be fully automated – Not requiring any human production effort



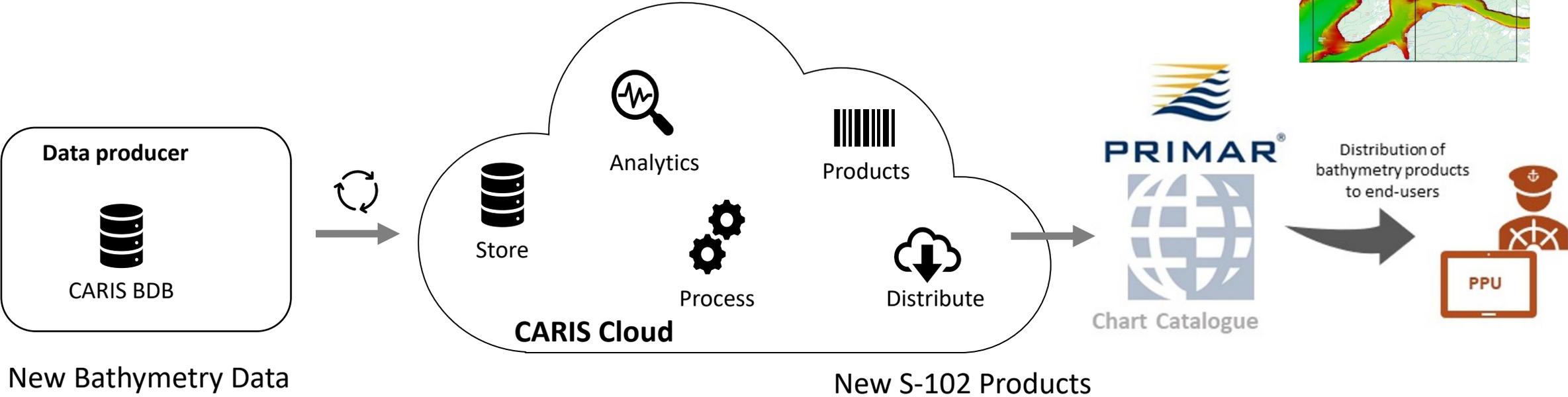
S-102 Data and the potential for e-Navigation

Demo scenario: Vancouver Harbour S-102 Datasets in Kongsberg S-102 Demonstrator



Videos: <https://s102.no/>

S-100 as a Service



Automated Products Pipeline

E-learning

 CARIS S-100 Online Workshop

CARIS S-100 Online Workshop with CARIS S-57 Composer

Teledyne CARIS is pleased to present this short online training program which looks at the International Hydrographic Organization (IHO) S-100 Standard, and the related S-101 Electronic Navigational Chart (ENC) Product Specification which is being developed to support the creation of next generation ENC products.

This workshop shows examples of creating and processing S-100 products in [CARIS S-57 Composer](#) but no software is required in order to participate.

- Information: workshop [description and requirements](#)

- Length: 8 hours (estimated - completion time will vary)

- Cost: \$300 USD** for 90 days access to the course - [registration information](#)

- **The cost is currently waived for CARIS software users who are part of the [CARIS Subscription Program](#).

[Register](#)

[Login](#)

CARIS S-100 Workshop

- Overview of S-100 and S-101
- Theory
- Concepts
- Expert background theory.
- No practical element

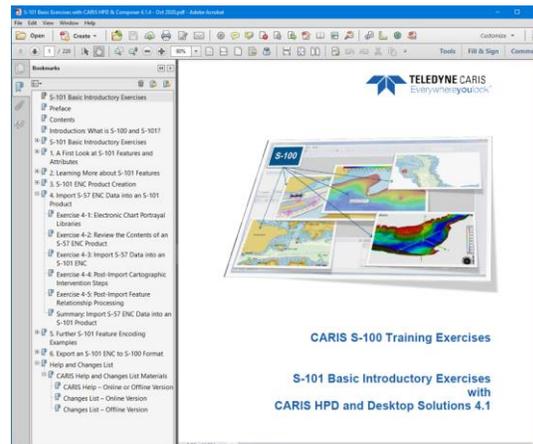
CARIS S-101 Production Course

- Learn about S-101 in general, and to learn about creating S-101 ENCs in Composer, using hands-on exercises

Available now

Expert Instructor Led Training

- World Class Training staff
 - CARIS actively participating in IHOs development of the S-100 standard
 - CARIS tools with S-100 support for more than a decade
 - CARIS assisting organizations on S-100 world wide
- Onsite or Remote



Attributes - AnchorageArea

Date end	20150202
Date start	20150101
Periodic date range 1	---0501,---1101
Date end	---0501
Date start	---1101
(New Periodic date range 2)	
(New Restriction 1)	

Attributes - ContiguousZone

In Dispute (New Nationality 1)	
Fixed date range	20150202,20150101
Date end	20150202
Date start	20150101
Scale minimum	

Attributes - AnchorBerth

Radius	
Status 1	1 (permanent)
Status 2	6 (reserved)
Status 3	8 (private)
Status 4	9 (mandatory)
(New Status 5)	

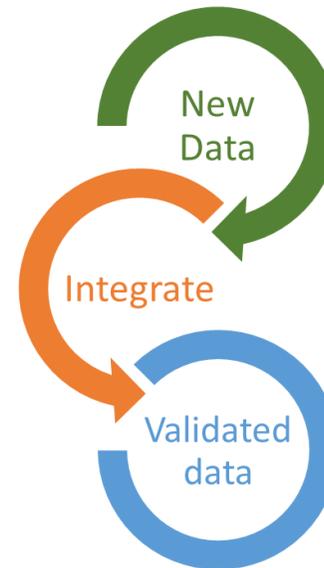
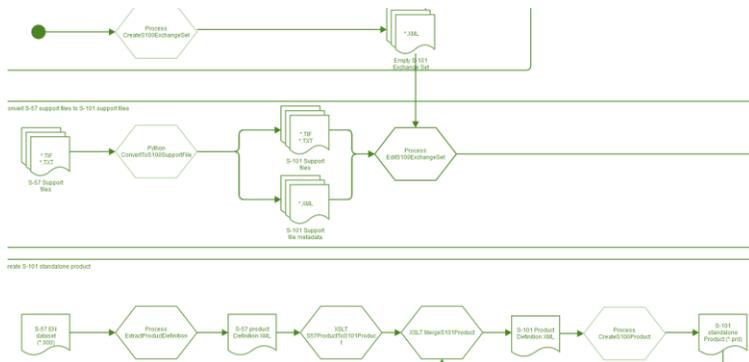
1. Complex Attribute

2. Multiplicity

5. Truncated Dates

Expert Led Consultancy

- Data model Assessment
- Best Practice analysis and advice
- Migration planning and advice
- Migration execution support
- Workflow and Automation Services

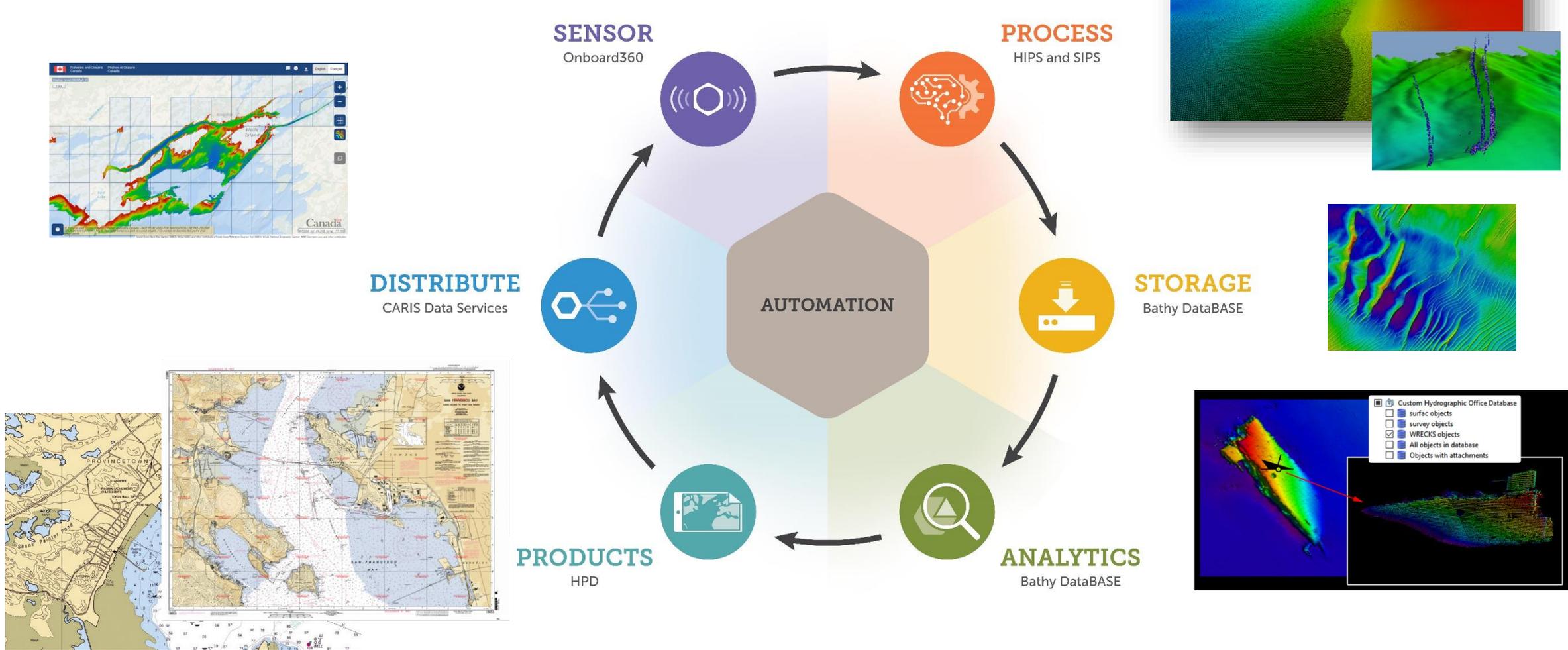


Automation

Some of the many possibilities - From ping to chart

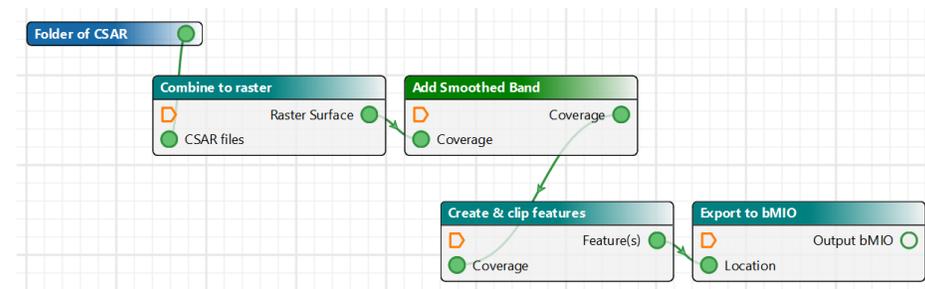
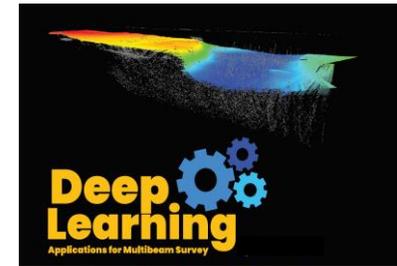
Teledyne CARIS

Ping-to-Chart Workflow



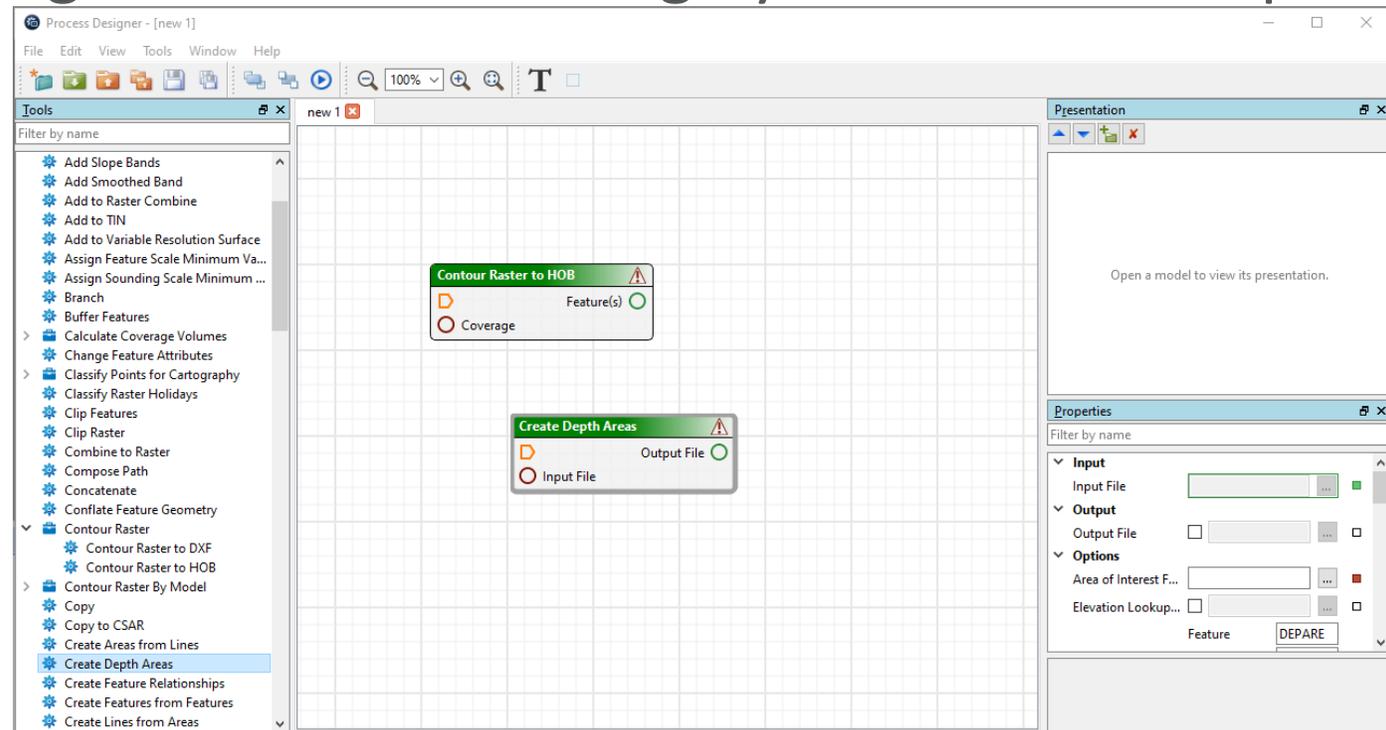
Automation

- The goal is to have automation underpinning the entire Ping to Chart workflow
- Automate through:
 - APIs, Process Models and Batch processing
 - Process Server to manage and run CARIS and user defined processes
 - Use of AI techniques
- Benefits
 - Faster and repeatable results
 - On-demand products and services
 - Reduced human effort
 - Produce multi-disciplinary products

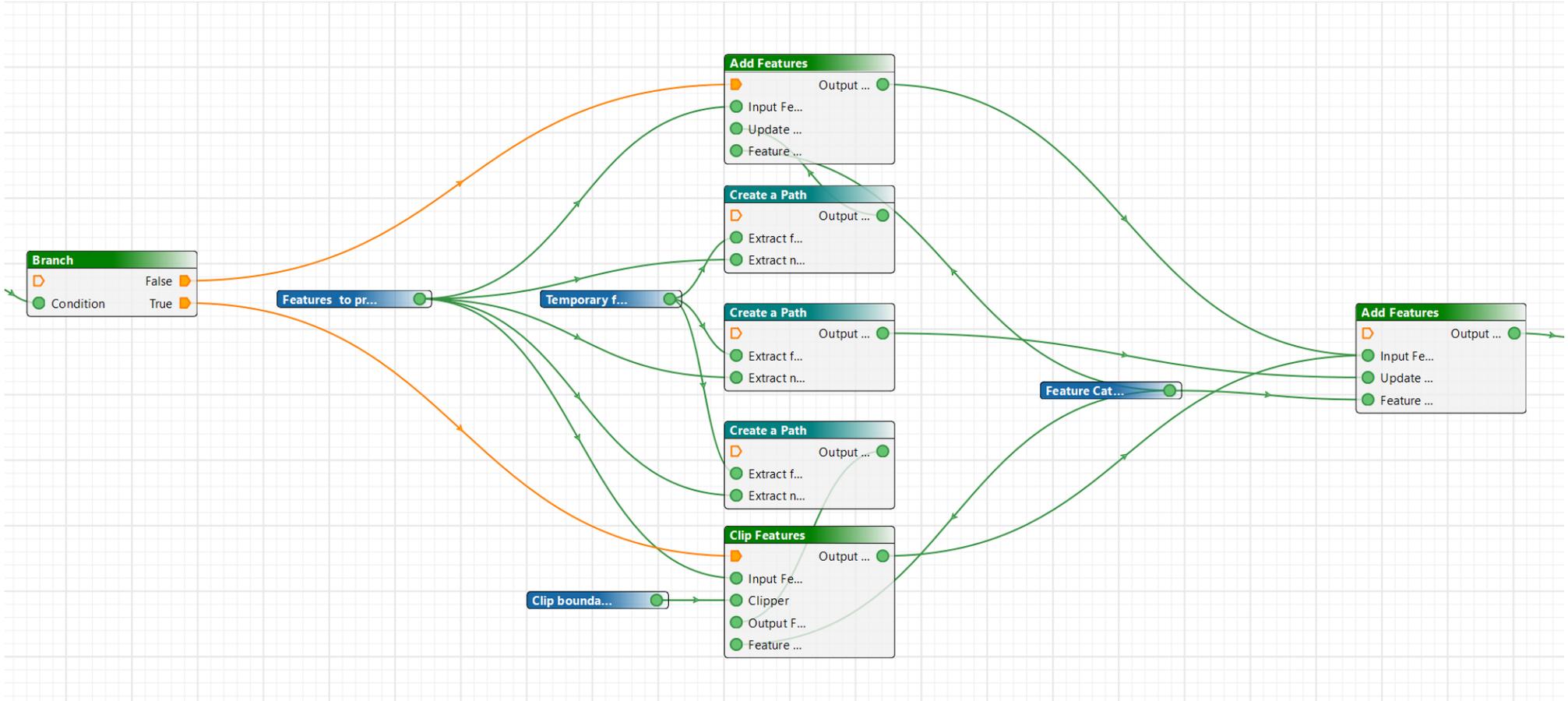


Process Designer

- Build automated workflow without programming/scripting experience
- Automation can be programmed too – Using Python and Batch processes



Automation – graphically organized



Automation and Paper Charts

Mix automated CARIS portrayal tools with workflow automation and webservice

Also available in desktop Paper Chart Editor for "traditional" workflow

Advanced (customizable) Portrayal capabilities

- Automatic INT1 portrayal of S-57/S-101 data
 - + New advance dynamic portrayal capabilities
- Automatic feature labeling/text
- Automatic borders and marginalia
- Automatic masking
- ...

Automated processes/workflows capabilities

- Data from ENC's (S-57/S-101) or HPD source
 - I.e. same source data used for ENC's, INT charts, Small Craft Charts, List of Lights, etc.
- Automatic creation of updated products

Webservice for the end users

- Controlled access to service
- Allow users to chose their chart and subscribe to updates

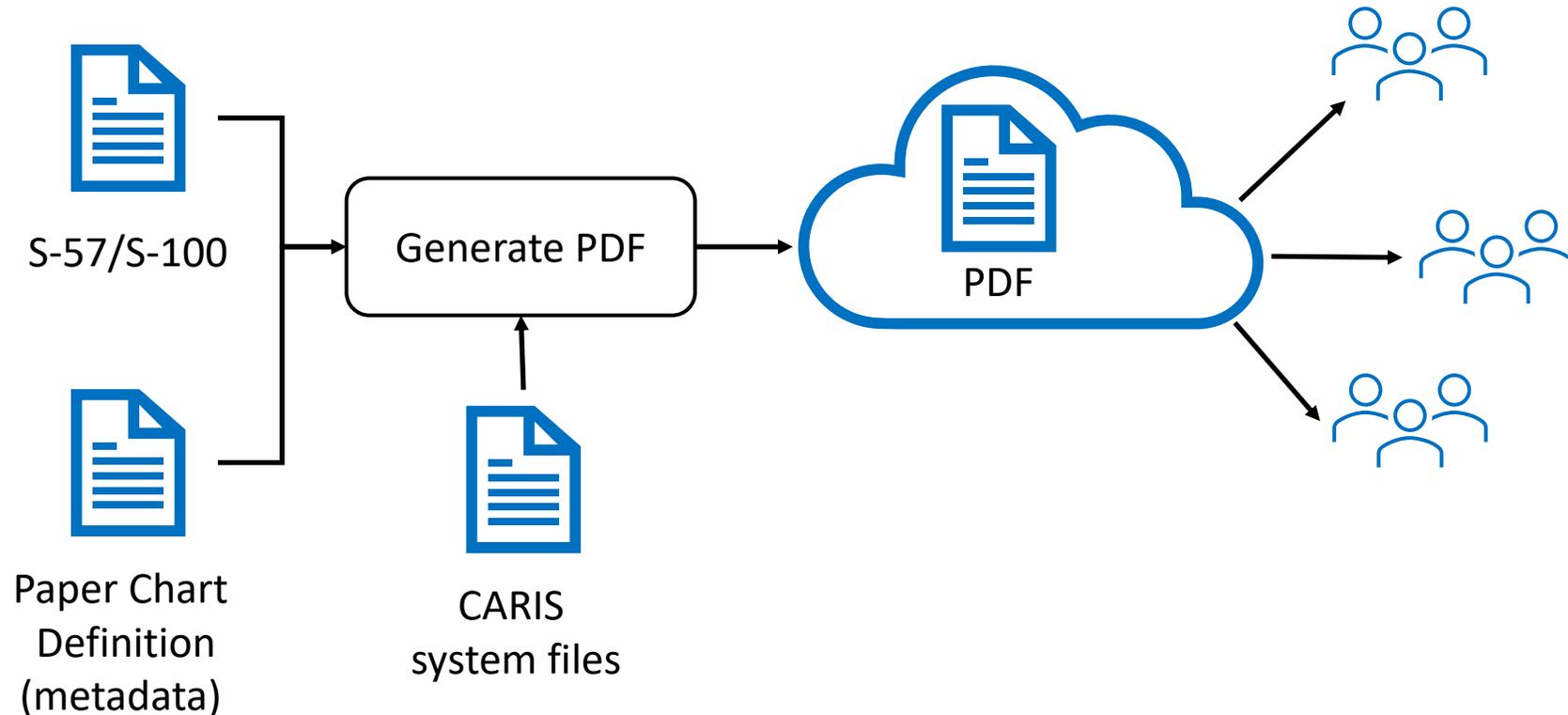
The composite image illustrates the integration of various tools in the CARIS workflow. At the top right, a metadata table provides details for a specific chart:

Chart Number	0217A
Chart Presentation	Sample INT1 Dynamic
Number of Notices	
User Name	user457
Date	20190217
Chart Type	INT Chart
International Chart	10027
Sea Area Number	
Name of Sea Area (South Coast)	
Name of Sea Area (
Name of Region (L	
Name of Region (L	
Chart Title (Langua	Plymouth
Chart Title (Langua	
Publication Country	
Partner Country	
Publication Date	20190218
Edition Number	1
Edition Date	20190217
Latest Notice to M	20190217/123
Comments	

Below the table is a nautical chart snippet for Plymouth, with a yellow circle highlighting the chart title and number. To the right is a workflow diagram showing the process from 'Folder of CSAR' to 'Raster Surface' and 'Coverage', then through 'Add Smoothed Band' and 'Create & clip features', and finally 'Export to BIMIO' to produce 'Output BIMIO' and 'Location'. At the bottom is a full view of a nautical chart showing depth contours and landmasses.

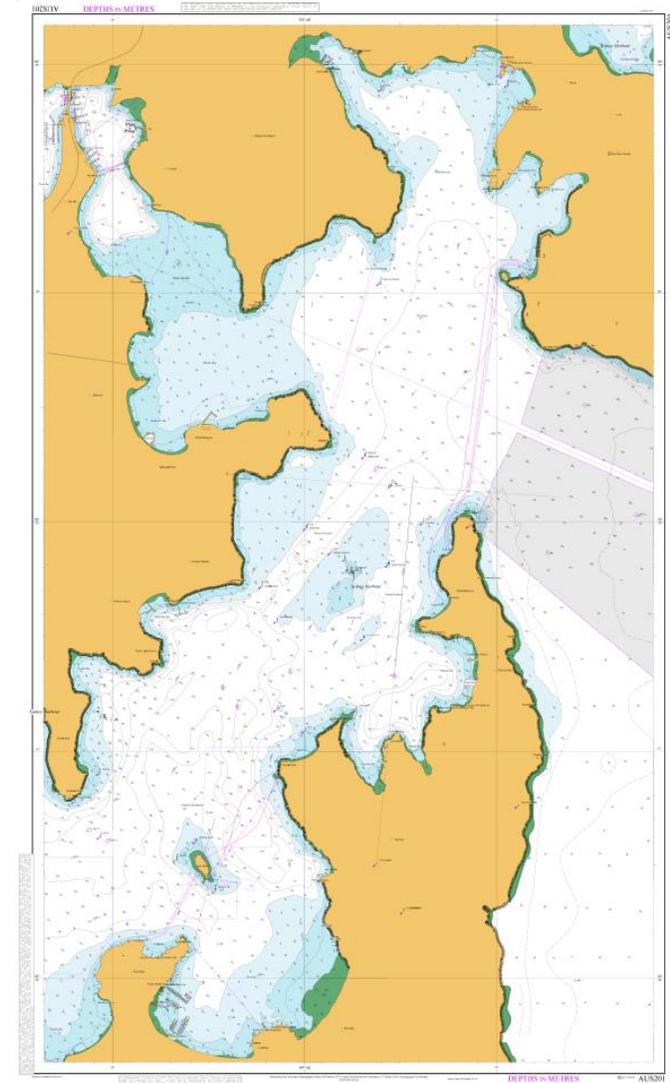
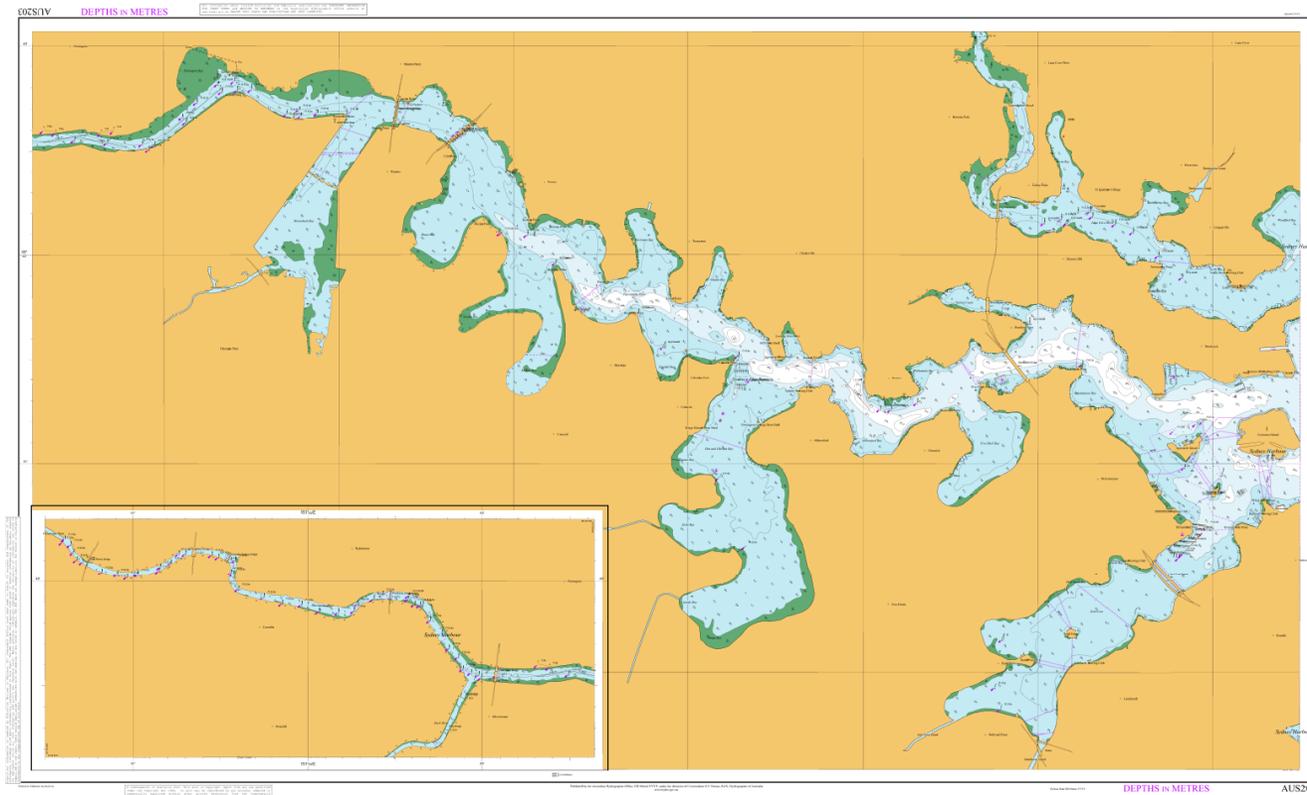
Product on Demand – Automatic paper chart creation

Utilizing CARIS' advanced automated (and customizable) portrayal rules



Without the need for paper chart editor - I.e. no manual cartographic editing

Using existing national colour and symbols



Self-service download

Possible to utilize HOs chart catalogue

- E.g. use existing chart boundaries, scales
- Ensuring products are suitable for navigation

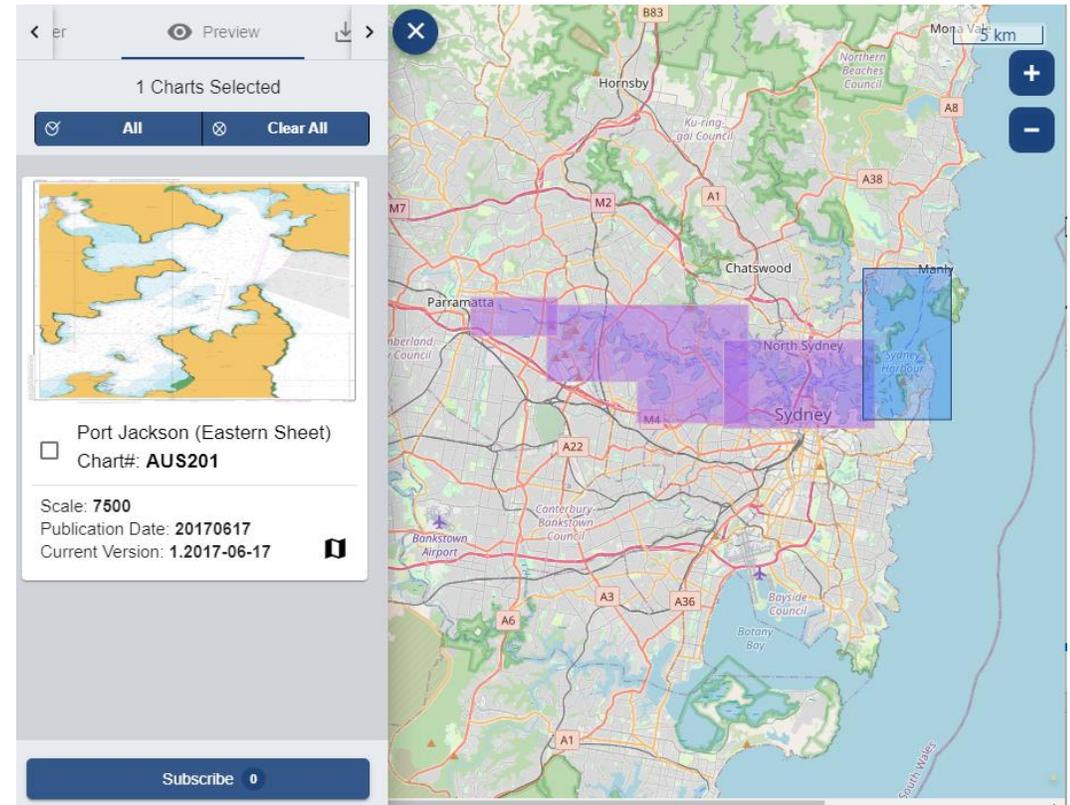
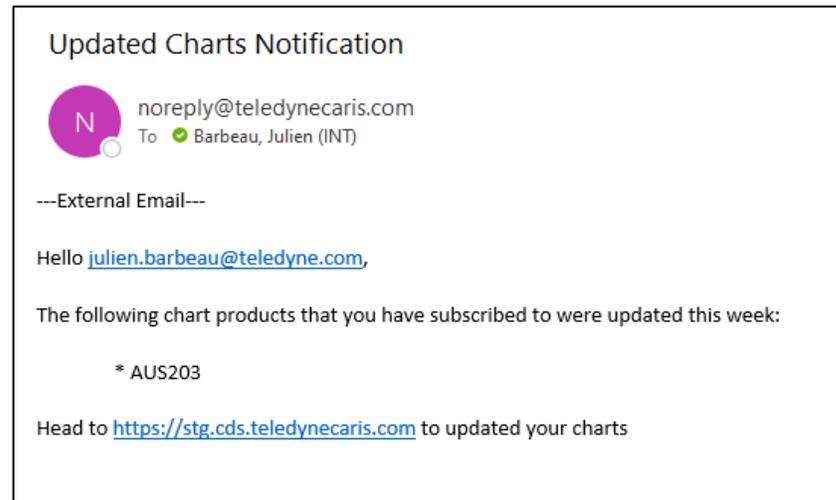


A screenshot of a mobile application interface. On the left, a panel displays a list of chart details. The top of the panel has a 'Preview' header and a 'My Downloads' button with a '2' notification. Below this are filter buttons: 'All', 'New', 'Updated', and 'Clear All'. The list contains two entries, each with a checked checkbox and a close button (X). The first entry is for 'Port Jackson(western Sheet)parramatta And Lane Cove Rivers' with Chart# AUS203, Scale 10000, and Publication Date 2017-06-17. It includes a yellow 'Updated chart available' notification. The second entry is for 'Port Jackson (Eastern Sheet)' with Chart# AUS201, Scale 7500, and Publication Date 2017-06-17, with a green 'You have the latest version' notification. At the bottom of the panel are 'Remove' and 'Download 2' buttons. On the right, a map of Sydney, Australia, is shown with a purple rectangular overlay indicating the chart's geographic area. The map includes labels for various locations like Hornsby, Parramatta, Chatswood, and Sydney, as well as roads and water bodies. A scale bar at the top right of the map indicates 5 km.

Users subscribe to products

Allowing users to subscribe to the charts

- Getting notified about updates

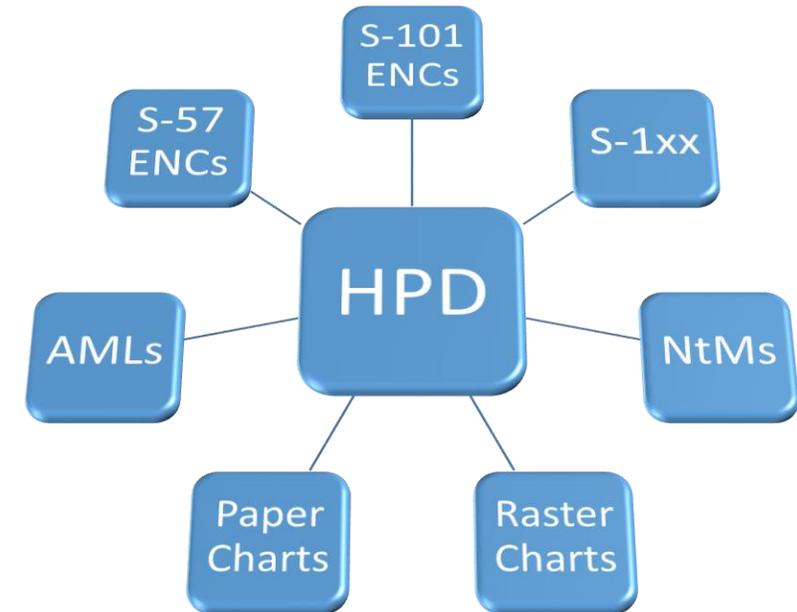


Multi-Fuel Production

Supporting multiple products and services from a common source

Geospatial solutions for S-100

- One Feature One Time
 - Parallel production of S-101 ENC's, S-57 ENC's, and other products from the same source data
 - Ability to reduce duplication of data and effort with a database driven approach and automation
 - Automation of product create/update minimizes additional overhead
 - Solution to meet current mandates and produce existing products, and produce new products and support new data users with the same resources



S-100 Modules

S-100 Module	Edit S-100 features	S-57 -> S-101 conversion	S-101 -> S-57 conversion	Dual fuel S-57 & S-101 ENC production	S-100 Source database	Export S-101 new edition	Export S-101 Update	S-101 exchange set
HPD Server	✓	✓	✓	✓	✓	✓	✓	✓
S-57 Composer	✓	✓	✓	✓		✓	✓	✓

- Vector S-100 production in Teledyne CARIS software
 - Desktop application: **S-100 Module for S-57 Composer**
 - Enterprise solution: **S-100 Module for HPD Server**

CARIS solutions for S-100

- Native support of S-100 Concepts within CARIS
 - Not just Import/Export
- Allows users to access familiar tools to create features and attributes using S-100 encoding
 - Complex attributes
 - Multiplicity of attribute values
 - New attribute types (e.g. Boolean, Dates)
 - Information objects
- Users can focus on learning the standard, not on learning new tools
- Customizable and extendable
 - Tailor to needs
 - Define and make new products

Attributes - ContiguousZone

Attributes	
In Dispute	
(New Nationality 1)	
Fixed date range	20150202,20150101
Date end	20150202
Date start	20150101
Scale minimum	

Attributes - AnchorageArea

Date end	20150202
Date start	20150101
Periodic date range 1	----0501,----1101
Date end	----0501
Date start	----1101
(New Periodic date range 2)	
(New Restriction 1)	

Attributes - AnchorBerth

(New Periodic date range 1)	
Radius	
Status 1	1 (permanent)
Status 2	6 (reserved)
Status 3	8 (private)
Status 4	9 (mandatory)
(New Status 5)	

1. Complex Attribute

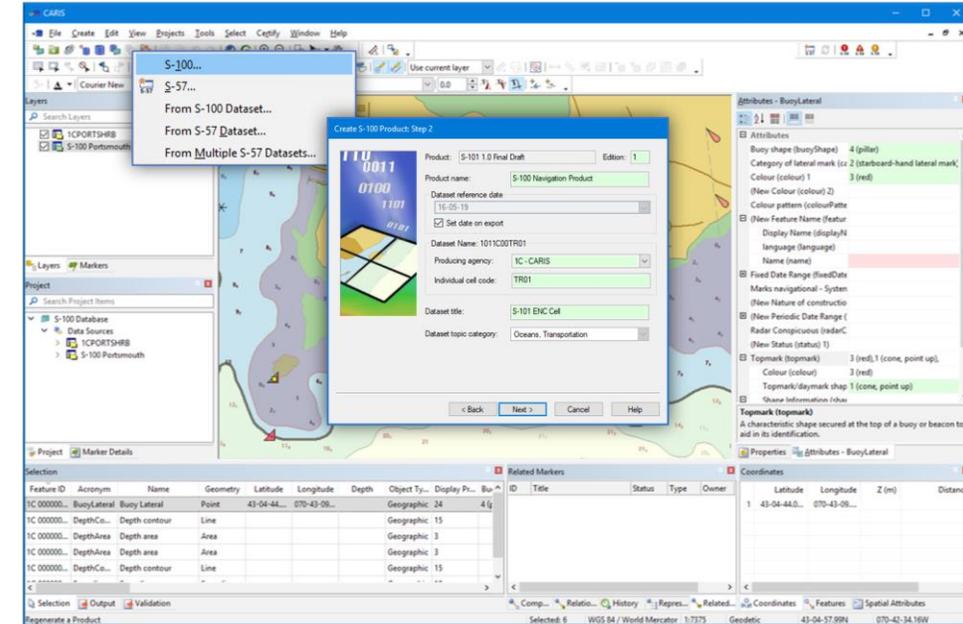
2. Multiplicity

5. Truncated Dates

a

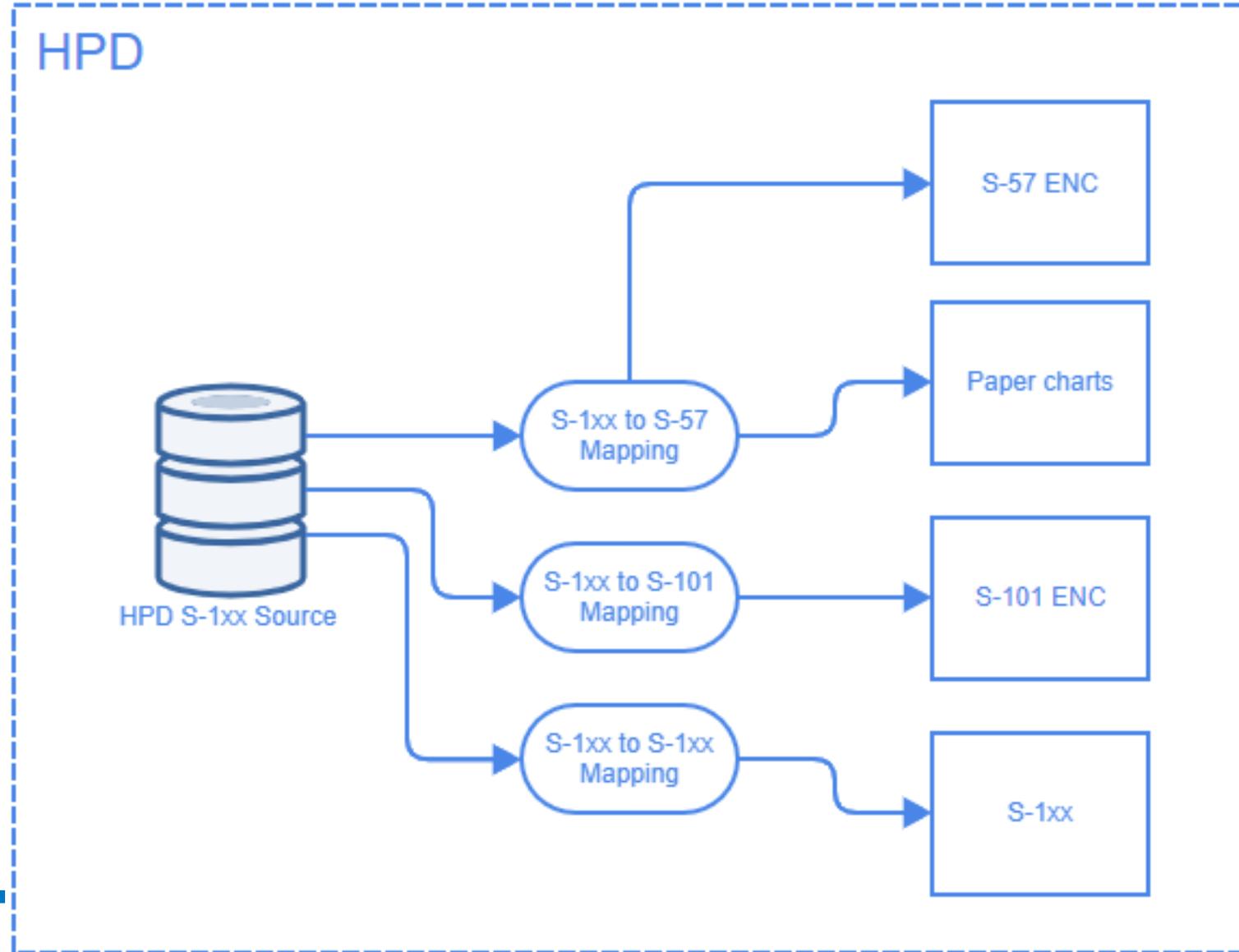
S-100 module for HPD Server

- Native support of S-100 GFM within CARIS
- Enable S-100 support in HPD
- **Multi-fuel solution to produce S-57 & S-101 ENCs** as well as paper charts and other products
 - Add S-100 production lines while **retaining** existing S-57 & paper chart production
- High conversion ratio between S-57 <> S-101
 - **Customizable mapping rules**
- Automation of workflows to avoid extra work to produce additional products



HPD S-100 Source

- Available
 - All HPD Source in S-100 data model
 - Encode value-added information in S-1xx source
 - Multiple S-100 production lines
 - Migration of source from S-57 to S-100+
 - Retain History
 - Retain Products
 - Convert/Filter into products



In place Migration – History Retention

- Convert HPD Source features from S-57 to S-101+ as new version of same object.
- History and Identifiers retained in source and products

Feature ID	Acronym	Name	Geometry	Latitude	Longitude
GB 2135131834 00687	BCNCAR	Beacon, cardi...	Point	32.521525400S	060.93769700

Attribute	Value
BCNSHP (Beacon shape)	(Unknown)
CATCAM (Category of cardinal mark)	3 (south cardinal mark)
COLOUR (Colour)	6 (yellow),2 (black)
COLPAT (Colour pattern)	1 (horizontal bands from top to bottom)
CONDTN (Condition)	

Feature ID	Acronym	Name	Geometry	Latitude
GB 2135131834 00687	BeaconCardinal	Beacon Cardinal	Point	32.521525400

Attribute	Value
beaconShape (Beacon Shape)	(Unknown)
categoryOfCardinalMark (Category of Cardinal Mark)	3 (South Cardinal Mark)
colour (Colour) 1	6 (Yellow)
colour (Colour) 2	2 (Black)
colourPattern (Colour Pattern)	1 (Horizontal Stripes)
featureName (Feature Name) 1	„S. Lookinghaven
name (Name)	S. Lookinghaven
topmark (Topmark)	2 (Black),14 (2 Cones (Points Downward)),
colour (Colour)	2 (Black)
topmarkDaymarkShape (Topmark/Daymark)	14 (2 Cones (Points Downward))

Database In place Migration – History Query

- History shows when feature was migrated
 - Change Feature Code event
- Historical content can be accessed as it was.
 - Current feature in S-101, historical in S-57

History			
Timestamp	Event	User	Project
20230612 15:38:22	Change Feature Code	U1S5721...	Update...
20230612 14:26:34	Attributes Verified	U1S5721...	

Output
===== Results of object comparison - start: Sep 13, 2023 9:22:18 AM ===== GB 2135131834 00687 Object class changed from BCNCAR to BeaconCardinal - not comparing attributes. Added relation to: GB 2135148730 00687 (LightAllAround)

History Information

Attributes

Attributes	
BCNSHP (Bea	(Unknown)
CATCAM (Cat	3 (south cardina
COLOUR (Col	6 (yellow),2 (blac
COLPAT (Col	1 (horizontal bar
OBJNAM (Obj	S. Lookinghaver

Define Source to be Superset of Products

- Merge Feature Catalogues to define the common model
 - Eg S-101 + S-122 + S-123 + S-401...
 - Resolve inconsistencies
 - different versions of concepts from registry
- Each feature class only defined once
 - Include Attributes needed to support the set of products
 - Eg Radio Station attributes for S-101 and S-123 in one feature
 - Associations with other objects

Use source in multiple products

- Products auto filter content which is not applicable
 - Only applicable properties go in products
 - Mapping/conversion from source to product is possible
 - Products can select from source usages/layers to include desired content
- Update products using changes from source
 - Automation can be used to reduce overhead
- Export products into exchange sets
- Integrate with services for product validation or distribution



HPD ENC Automation

CARIS HPD ENC Automation

S-57 ENCs *and* S-101 ENCs

Automate ENC production and updating straight from HPD Source

- By-pass manual Editor steps – Reducing the need for HPD Product Editor
- HPD Builder license required

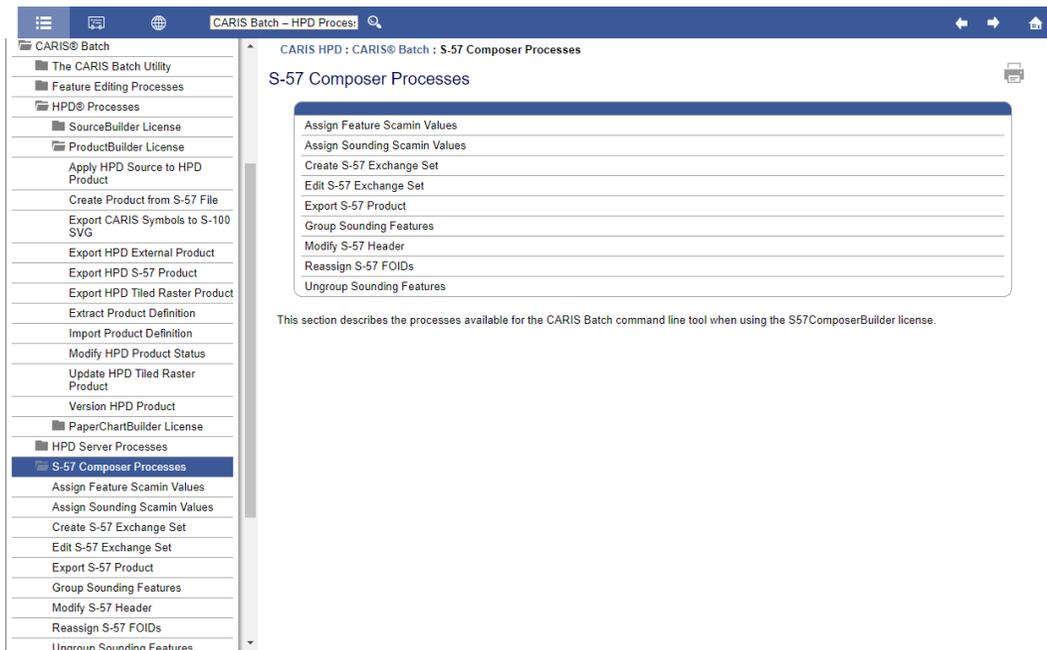
New set of CARIS Processes for ENC Automation

Supports the ENC lifecycle

- Create ENC products
- Update ENC contents
- Manage ENC contents
- Export ENC products
- Process ENC Exchange Sets
- Manage product versions (update or new edition)

CARIS HPD ENC Automation Support

Documentation and Training available



TELEDYNE
Teledyne Geospatial
115 Waggoners Lane
Fredericton, NB, Canada, E3B 2L4
P: 506-459-8533 F: 506-459-3849
www.teledynegeospatial.com

S-57 ENC Workflow Automation using CARIS Processes in HPD

Description:
This short training course examines some new **S-57 Electronic Navigational Chart (ENC) workflow automation** options in a **CARIS HPD database** using a new set of **CARIS processes**. It begins by introducing the S-57 ENC automation processes, what they do, and where to find out additional help. This is followed by a look at the **CARIS Process Designer** program and using it to create interactive **process models** to execute one or more processes. The final part examines the **CARIS Batch program** and how to use it to execute processes. The course includes hands-on exercises throughout explaining how things work.

Audience:
This course is specifically designed for existing HPD users who are interested in learning about new S-57 ENC workflow automation options in their CARIS HPD databases, and understanding how to implement the new CARIS processes into workflows using CARIS process models and/or using the CARIS Batch program.

Topics include:

- ✓ A general introduction to CARIS processes
- ✓ Background information about the new ENC workflow processes
- ✓ Where to find information about CARIS processes in the HPD Help
- ✓ How processes work, expected input, output, and optional parameters
- ✓ Executing CARIS processes using process models and with CARIS Batch
- ✓ An overview of process models and creating them using Process Designer
- ✓ The Process Designer program user interface, terminology and concepts
- ✓ Creating process models and defining their parameters and values
- ✓ Further advanced process model options and linking multiple processes
- ✓ How to run Process Models to execute CARIS processes in HPD
- ✓ The CARIS Batch command line program overview and basic concepts
- ✓ How to start and run CARIS Batch and finding further help information
- ✓ Using CARIS Batch to run CARIS processes: input, output, options, etc.
- ✓ Examples of using CARIS Batch to execute different processes

Prerequisites:

- ✓ Good knowledge of the IHO S-57 ENC production and workflow
- ✓ Hands-on working experience using CARIS HPD is required

The block includes several small screenshots from the training course. One shows a 'What's New in HPD' announcement. Another shows a process model diagram with nodes and arrows. A third shows the 'Process Designer' tool interface with various input fields and buttons. A fourth shows a list of processes in the HPD interface.

Nautical Publications Production

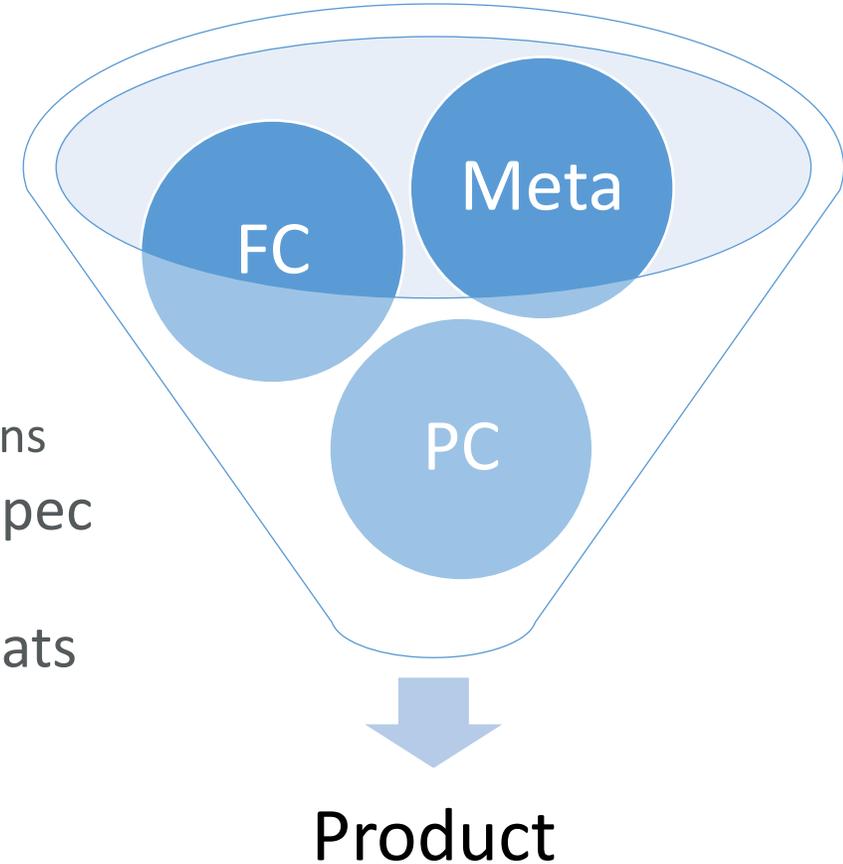
Support of Nautical Publications

Support for NPubs in CARIS HPD

- Traditional products using Npubs module
 - List of Lights
 - List of waypoints
 - Notice to Mariners
- S-100 Products using S-100 module
 - Define and create existing and new products using S-100 concepts
 - Mix and match with production of other products using Multi-fuel

Ingredients for an S-100 Product in CARIS HPD

- S-100 License
- Product Name and Version
- Feature Catalogue (Valid S-100 XML)
- Product parameters
 - such as encoding type (8211, GML ed 5) and options
- Definition of metadata applicable to product spec
 - Choices and default values
- Portrayal catalogue using S-100 standard formats
 - Symbol set – S-100 SVGs
 - Linestyles
 - Area Patterns
 - Ruleset
- Database template with associated rules to map from source



S-123 Example, CCG Project

- HPD Configured with Product spec info, FC etc.
- Content digitized from CCG RAMN textual tables and paragraphs into S-123 Features and attributes
- Geometries entered/loaded
 - Points from documented positions
 - Lines from various sources and formats
 - Radio coverage polygons defined using contouring from point clouds

S-123 Example export/style to HTML

Placentia MCTS Centre

MMSI: 003160019

Call Sign: VCP

All communications with Canadian Coast Guard Marine Communications and Traffic Services Centres are recorded. For Radio Service, call Placentia Coast Guard Radio. For Vessel Traffic Services, call Placentia or St. John's Traffic

Coordinates

Mailing Address:

Fisheries and Oceans Canada
 Canadian Coast Guard
 Officer-in-Charge – MCTS Operations
 Placentia MCTS Centre
 P.O. Box 389
 Placentia, NL A0B 2Y0

Telephone: 709-227-2181
 709-227-2182
 1-844-592-2770
 709-227-1027
 709-227-5731

Facsimile: 709-227-5637
 Email: Safety.Placentia@innav.gc.ca

Placentia MC

MCTS Operations
 MCTS Operations
 MCTS Operations Toll-Free

Letite 45°02'20"N 066°53'26"W	Ch14	-	-	-
Kingsburg 44°16'32"N 064°17'15"W	Ch16 Ch24 Ch26 Ch70	-	-	Ch24, Ch26: Facilities are available for connecting ships directly to the commercial telephone system on shore. VHF Direction Finding service is available.

Halifax MCTS/VCS - Broadcasts

Time	Site	Frequency or Channel	Contents
Continuous	Saint John (Red Head)	Ch21B	<ul style="list-style-type: none"> meteorological forecast navigational warning Radiotelephony (English followed by French) - Technical marine synopsis, forecasts and wave height forecasts for marine forecast areas 201 to 211. - U.S. weather forecasts for Coastal Waters (Eastport to Schoodic Point, Maine) and Offshore Waters (Gulf of Maine to the Hague Line). - Navigational warnings for areas Bay of Fundy, South and West Coast Nova Scotia. - Notices to Fish Harvesters (when available).

Facilitating experiments and testing

- How/where to setup a test environment
 - Create stand-alone file based products
 - Subscribe to CARIS HPD sandbox
 - Hosted in AWS with HPD and S-100 support files
 - Create test database instance separate from production
- Test
 - Feature creation
 - Product metadata
 - Export Exchange sets
 - Portrayal
 - Machine readable and user configurable
 - Validation
 - User configurable

Facilitating experiments and testing

- Data
 - Open/view the GIS data formats and content you are used to
 - View traditional data as layers beside new S-100 content
 - Existing data mapping/conversion and cleaning tools are available
 - Data validation and cleaning tools work
 - Visual and Feature differencing
 - Import, snap/grab, conflate etc

Thank You



Part of the Teledyne Imaging Group