

Automatic bathymetric compilation and acceptance



24th Baltic Sea Hydrographic Commission Meeting



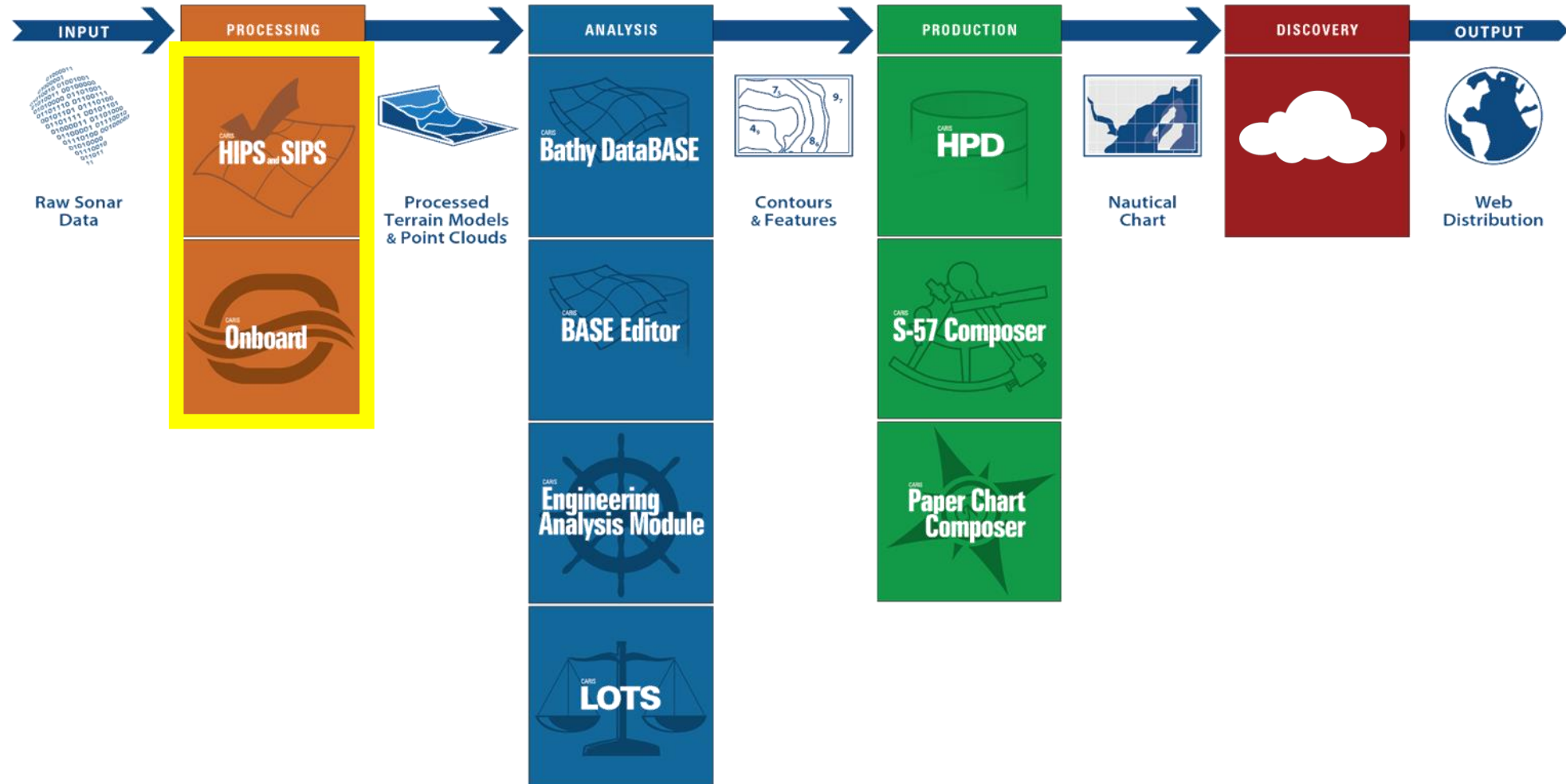
Open Forum Meeting: Bathymetric data processing for nautical products
Gdansk, Poland, 12 September 2019

Peter Schwarzberg peter.schwarzberg@teledyne.com

Topics

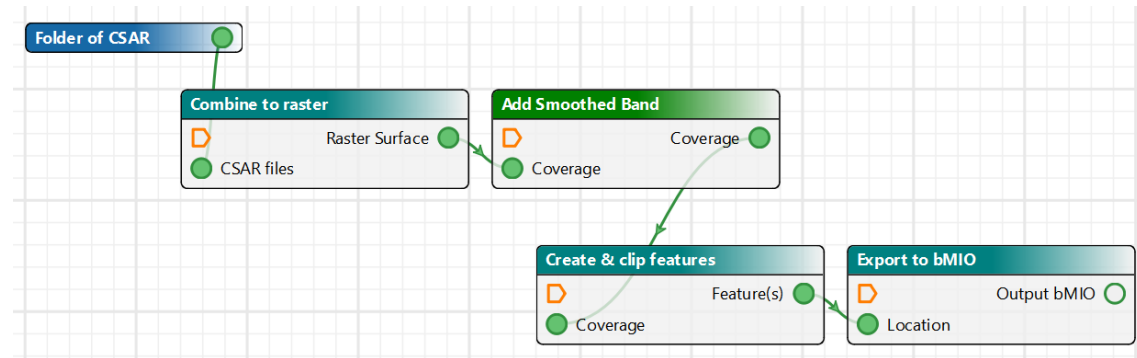
- Automation from Ping to Chart – and beyond
- BSH Bathy Compilation Workshop
- Beyond process automation
- Conclusion

CARIS Ping-to-Chart Workflow



Working with the data

- Automatically
 - Process Designer
 - Batch
 - Python
- And interactively too



Automation | Teledyne CARIS

teledynecaris.com/en/products/automation/


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AUTOMATION FOR MARINE SURVEY




Automate processing of raw survey data to usable products and information

- Customize the automation to your needs, reuse many times
- Control complexity by presenting simple workflow options to end users
- Identify problems in the field while you still have time to fix them
- Reduce costs with faster product turnaround


CARIS provides the industry's most comprehensive tools for automating your processing workflows.



CARIS Onboard
Bringing Efficiency to Survey Operations

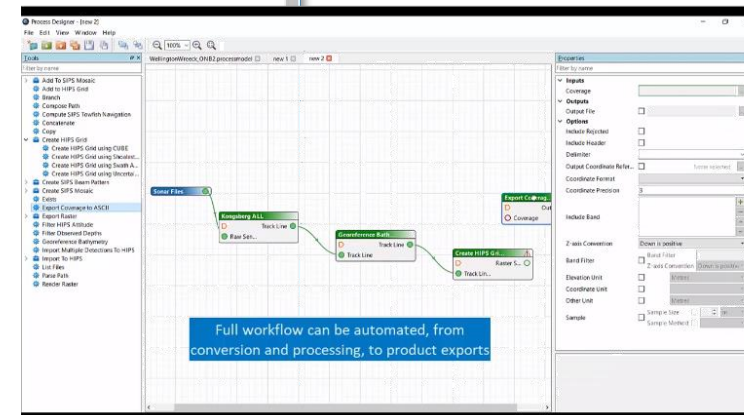


HIPS and SIPS
Comprehensive Sensor Processing System

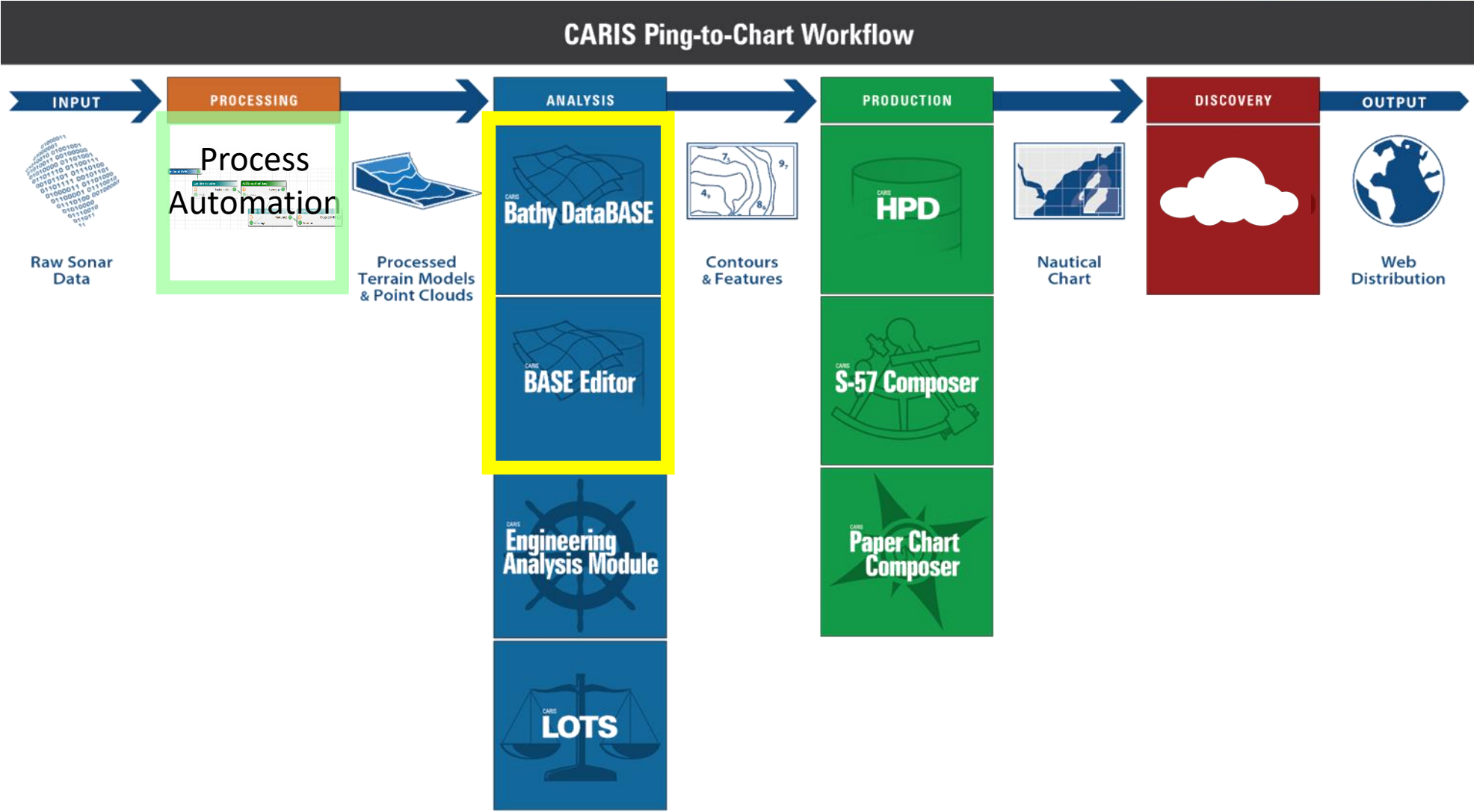


Bathy DataBASE
Advanced Analysis and Products

Videos



<https://www.teledynecaris.com/en/products/automation/>



Bathy Compilation Workshop

Bundesamtes für Seeschifffahrt und Hydrographie
Hamburg, April 2019

Karen Cove karen.cove@teledyne.com
Peter Schwarzberg peter.schwarzberg@teledyne.com



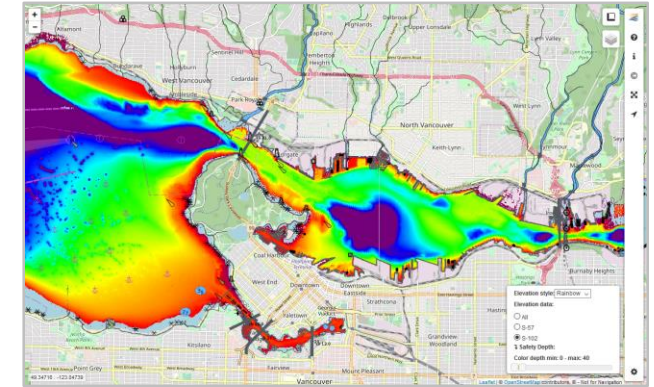
Bathy Compilation

Extracts from BSH Workshop, April 2019



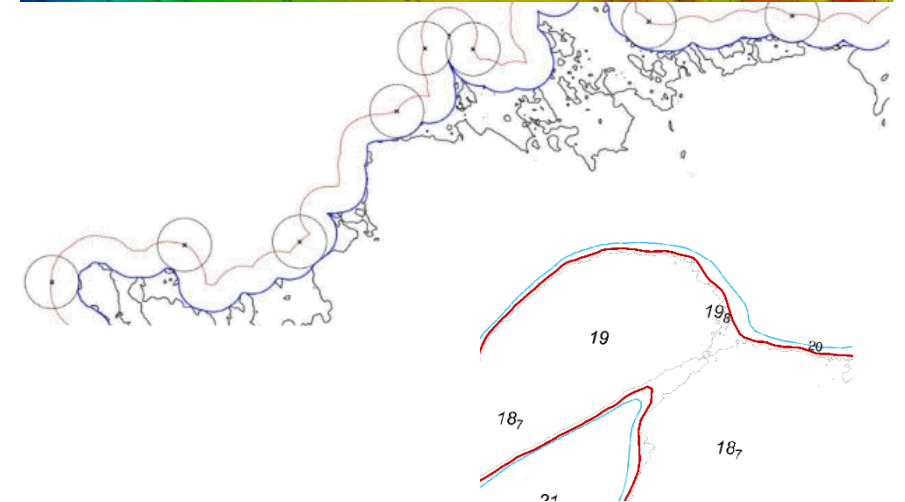
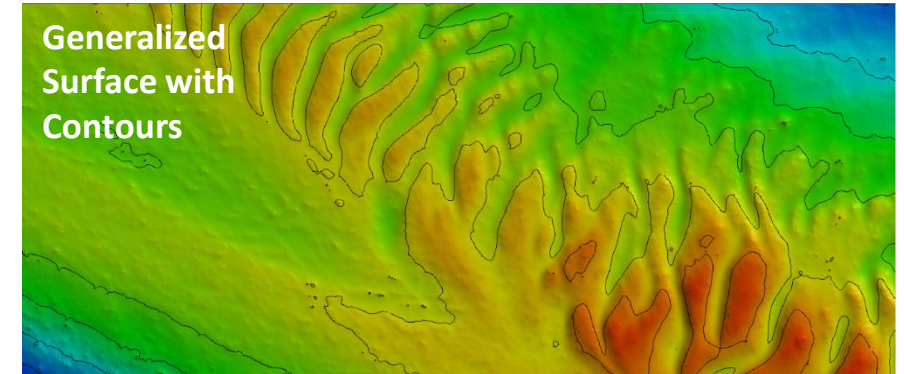
Generate Product Data

- Raster
 - S-102 for electronic chart navigation
 - BAG for data exchange
 - Tiled data for web services
- Vector
 - Complete products. E.g. High Density ENC, bENCs/bMIOs, overlays/special products
 - Features for production of S-57/S-101 ENCs, Paper Charts, Raster, ENC, IENC, AML, etc.
 - Export features for other purposes in many different formats
- Documents, reports or images
 - Export to Geospatial PDF, GeoTIFF, KMZ, etc.
 - ISO 19115 metadata



Automate chart feature creation

- Produce contours that are ready for charting and other GIS products *
- Generalize
 - Surfaces
 - E.g. using Rolling Coin algorithm Developed by the Traficom
 - Features
 - E.g. Contours using safe-side contour smoothing
- Sounding Selection
- Saved as S-57 (S-101) features ready for production



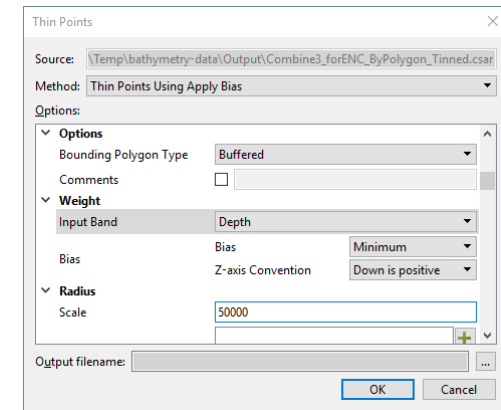
*) James Cooke, United Kingdom Hydrographic Office; Automated contour generation, Proceedings of CARIS 2017 International User Group Conference, June 2017

Automatic Sounding Selection

Examples of possibilities

Sounding Sounding Selection Tools

- New generation sounding selection tool adds new possibilities
 - Efficiently thin huge point clouds
- Advanced rules
 - Can consider bathymetry and non-bathymetric features
 - Classifies depths based on rule applied

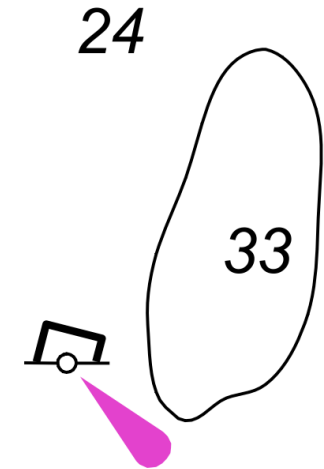


Automatically selecting depths

- Simplified said we consider 3 levels of importance:
 - Critical soundings
 - E.g. the shoalest in certain areas
 - Significant soundings
 - Indicating a change of depth that “stands-out”
 - Representative soundings
 - Those who doesn’t stand out, but generally represent the bathymetry

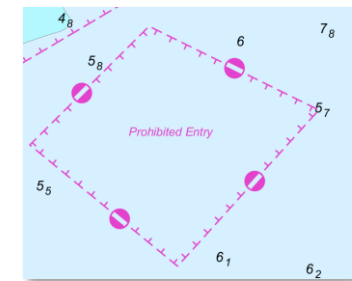
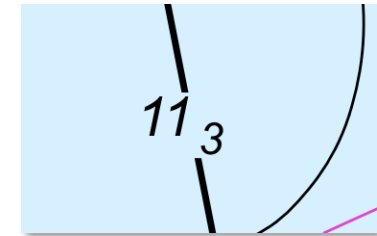
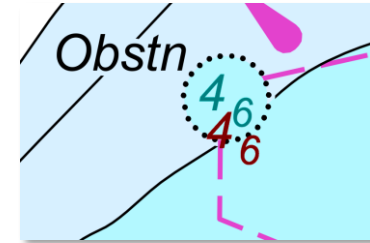
Selecting isolated shoals

- Select shoals/deeps in isolated depth areas
- Can identify “uncharted” shoals
 - On-the-fly comparing depth to surrounding seabed
- Can use features to ensure all depth areas has a sounding



Considering other features

- *Select or Suppress* depths near points
 - E.g. suppress depths close to (exiting) wrecks
- *Select or suppress* along *specified* lines
 - E.g. *select* at recommended tracks
 - E.g. *suppress* close to contours
- *Select or Suppress* depths inside certain areas
 - E.g. *select* inside fairways
 - E.g. *suppress* inside prohibited areas
- Will use existing data (e.g. from ENC's)

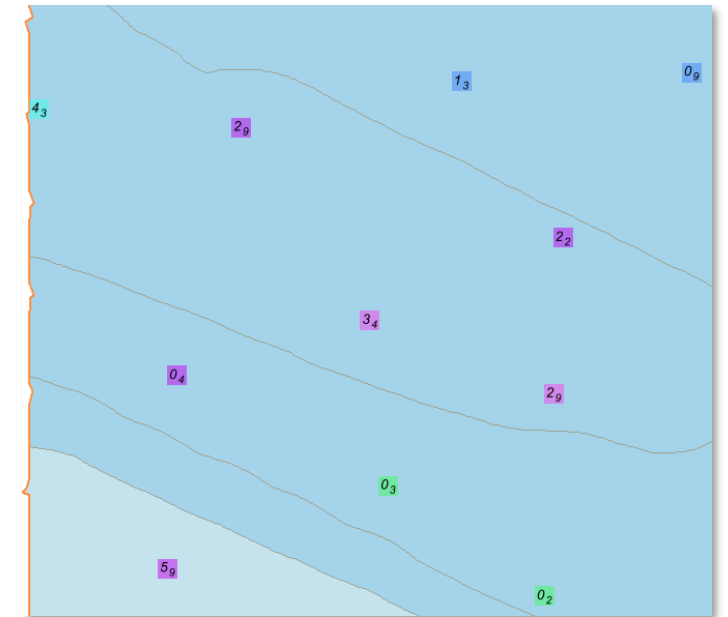


Sounding Classification

- Depths are classified based on the selection rule used

Selection						
Longitude	Latitude	Z	Status	Depth	Selection_State	Selection_Rule
008-52.381404E	53-51.948999N	7.7 m	Accepted	7.7 m	Selected (Automatically)	Isolated_Deep
008-52.334387E	53-52.407344N	0.6 m	Accepted	0.6 m	Selected (Automatically)	Isolated_Shoal
008-51.171617E	53-52.190297N	-0.2 m	Accepted	-0.2 m	Selected (Automatically)	Isolated_Shoal

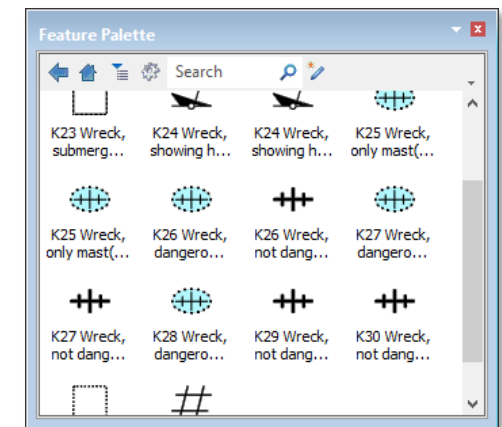
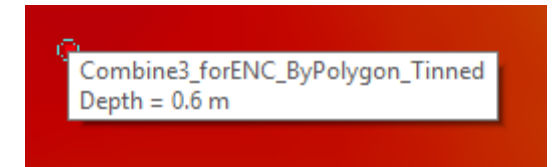
- Classification use include
 - Refine selection of soundings to use in products
 - Validate the results of the different rules applied
 - Bring forward for later cartographic or other use



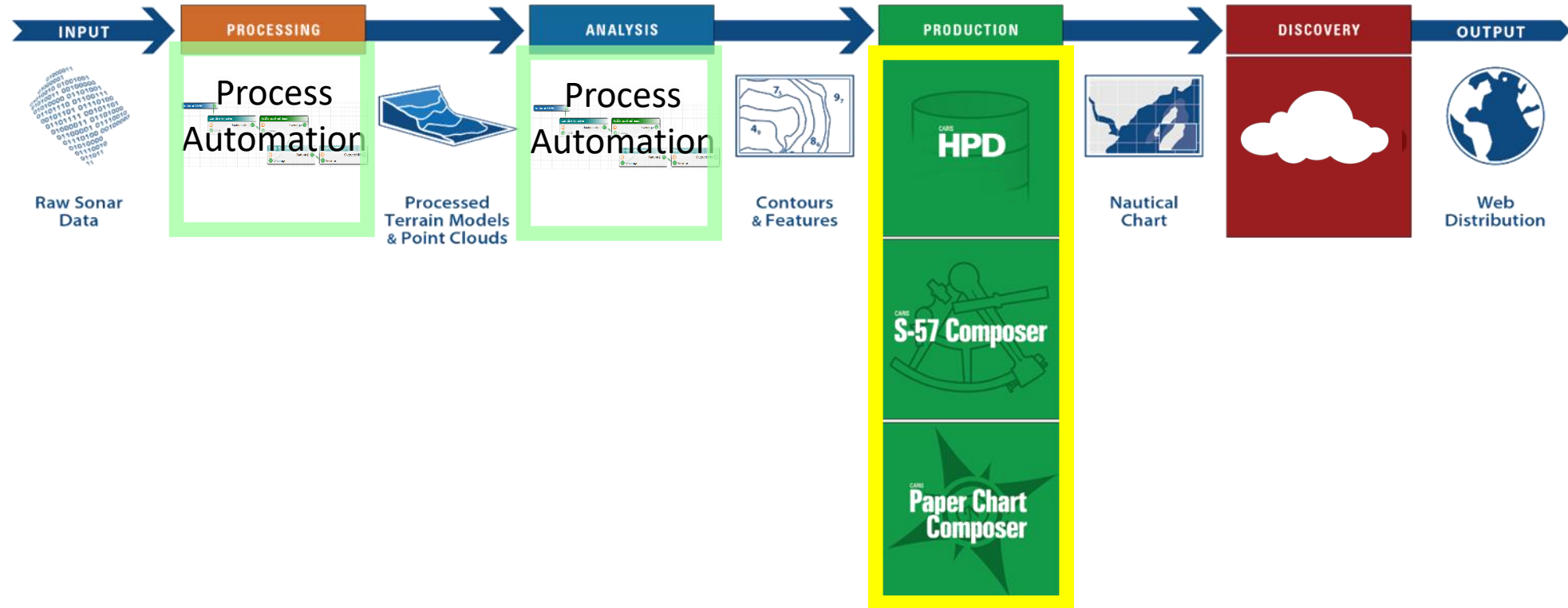
Colours highlighting different selection rules used

Soundings and Features

- Refine sounding selection interactively if needed
 - Quick Creator in the 2D view
 - Validate data (also in 3D)
- Interactively create non-sounding features
 - E.g. obstructions, wrecks, rocks
 - Also while cleaning/validating data in 3D Subset Editor

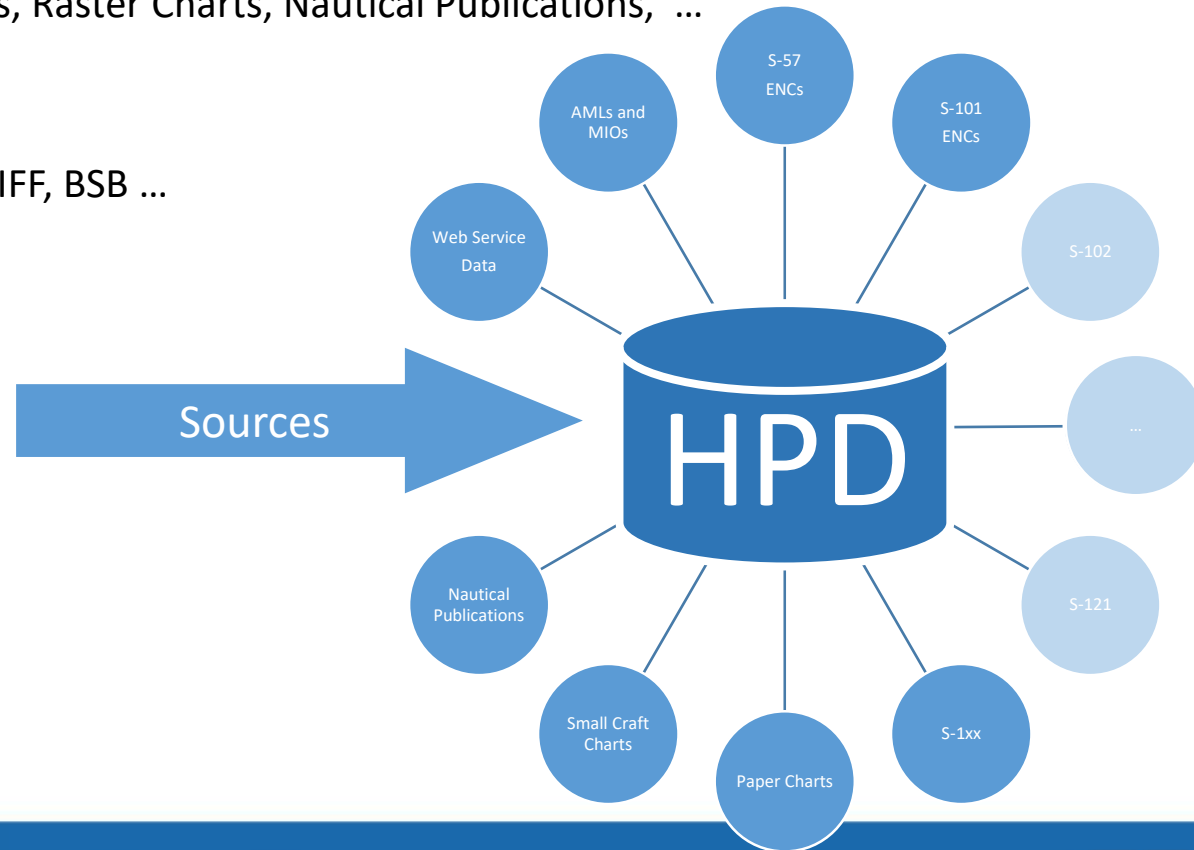


CARIS Ping-to-Chart Workflow



Create Products - ENC's, Paper Charts, ...

- The HPD data model supports multiple product types generated from the same database features
 - S-57 & S-101 ENC's, AMLs, Paper Charts, Raster Charts, Nautical Publications, ...
- Export formats
 - S-57 & S-101 Exchange Sets, PS, PDF, TIFF, BSB ...



WMS Service Using Raster Tile Product

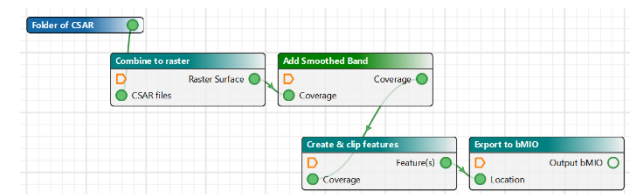
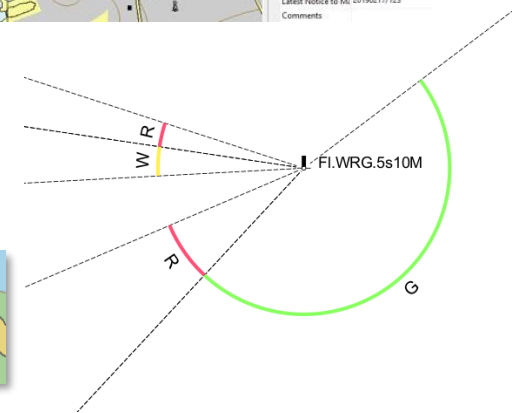
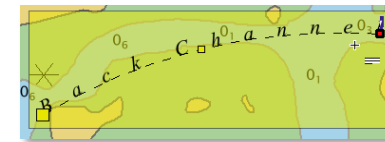
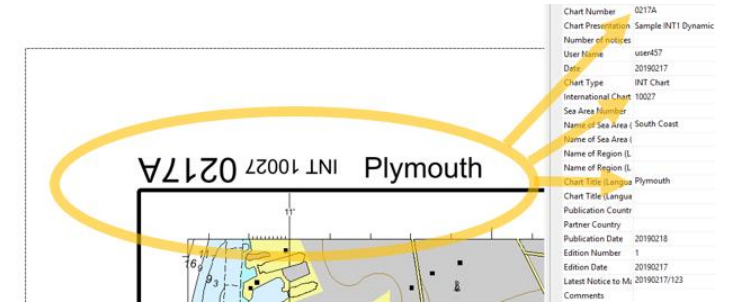
- Generated directly from Source
 - Metadata defines output
- Automatic export of updated data
 - Executed without human interaction
- Product defined once



<http://sjofartsverket.se/sv/Snabblankar/Kartviewers/Felanmalda-sjosakerhetsanordningar/>

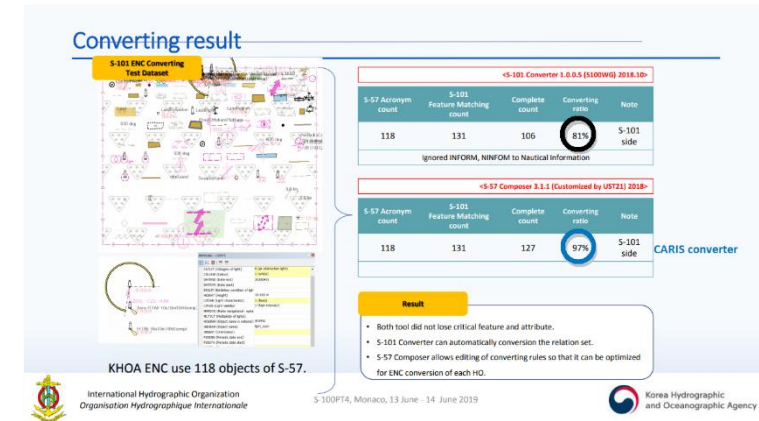
Production Automation

- Automatically create paper charts features
- New dynamic on-the-fly portrayal
 - Still *allowing* interactive overwrite
- New process automation capabilities available too



Production Automation

- S-101 ENC production from existing ENC portfolio
 - Or new product/cell scheme
- New process automation is going to allow ENC updating & export
 - Daily/weekly/...
- Goal: Dual S-57 and S-101 production with even less effort/resources



Online Help – Also for automation

- HTML Help

- With Search options
- Available online
- *Can install locally*

- Other Guides

- Changes List
- Installation Guide
- Upgrade Guide

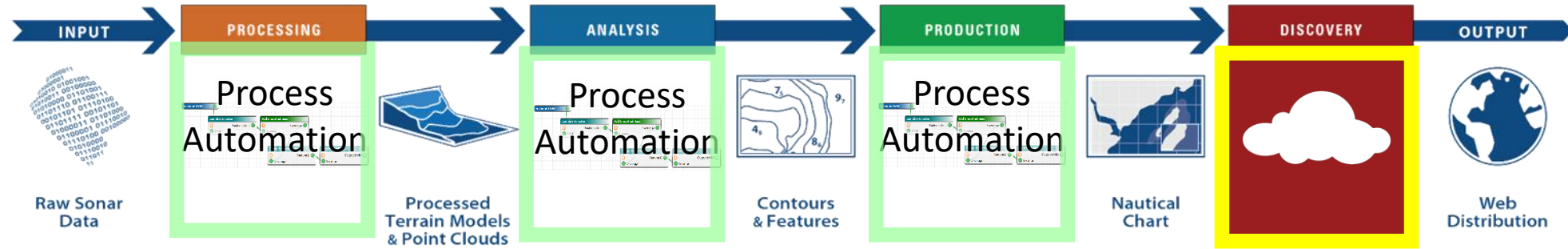
- CARIS Technical Staff – On-site or Off-site

On-line guides in your locale language using Google Translate (Requires internet connection)

CARIS HPD 4.0
Changes List

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CARIS Ping-to-Chart Workflow



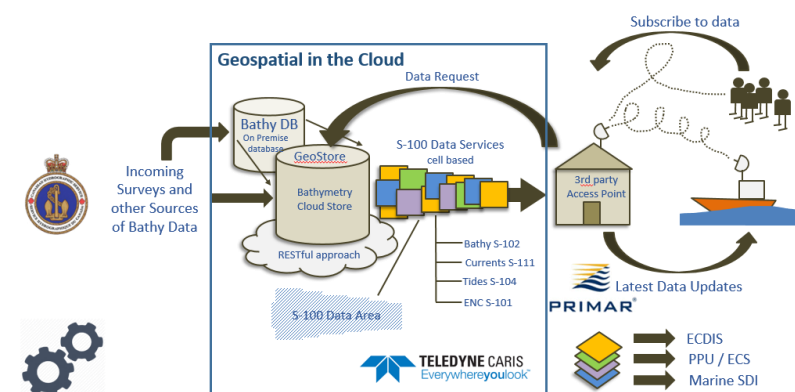
Geospatial in the Cloud - S-100 Data as a Service

- Joint project
 - CHS (HO), Teledyne CARIS (geospatial software) and PRIMAR (ENC distributor)

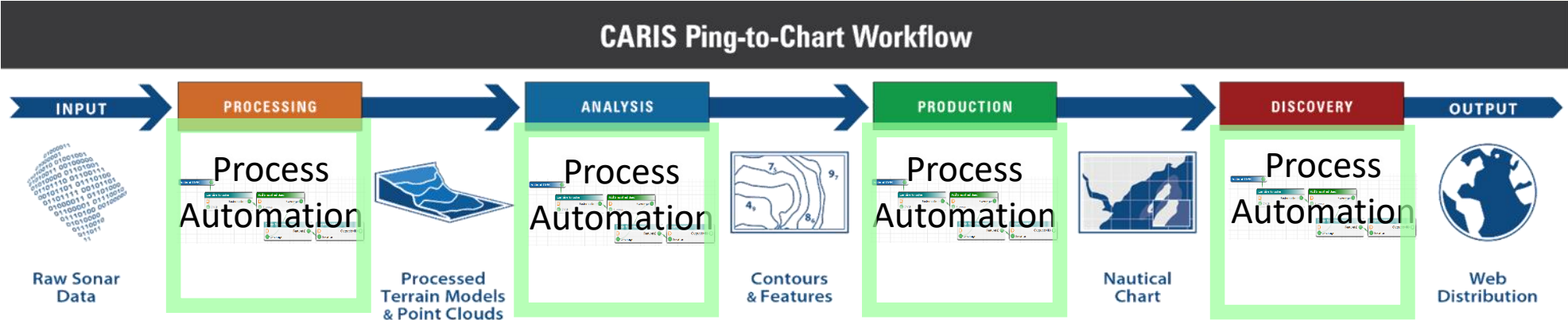


- Data/product distribution from source (HO) to user (RENC/VAR, etc.)

- Initial focus on S-102
 - Expanding to other data/product types

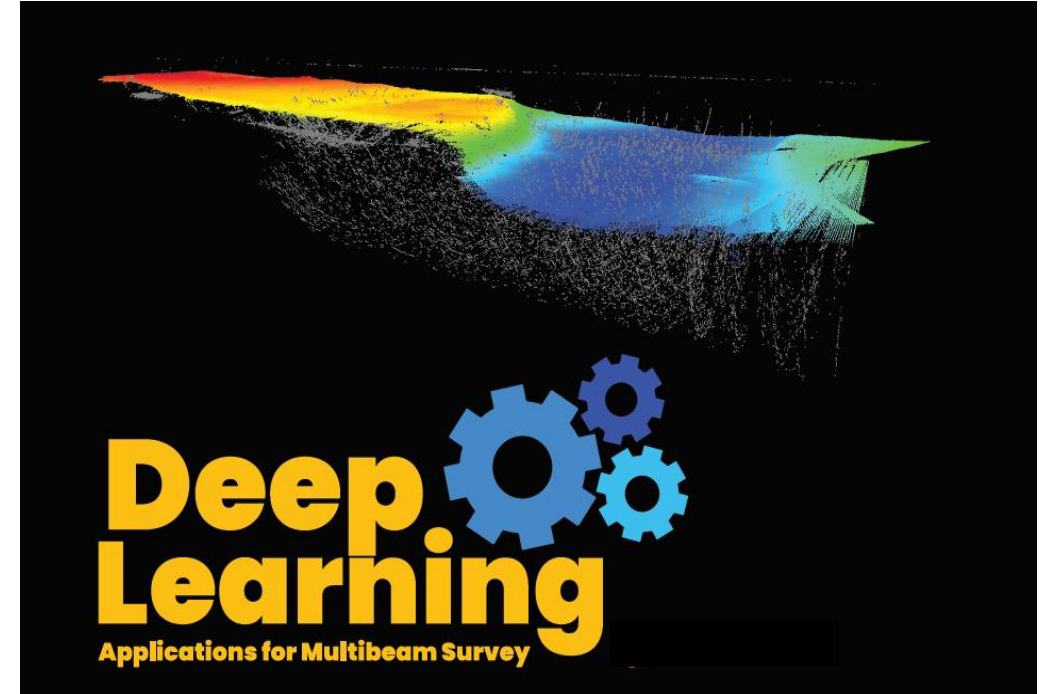


- Support defense, National SDI Portals, other government agencies, data requests for science, GEBCO Seabed 2030 data nodes, other industries wanting to offer added value to data

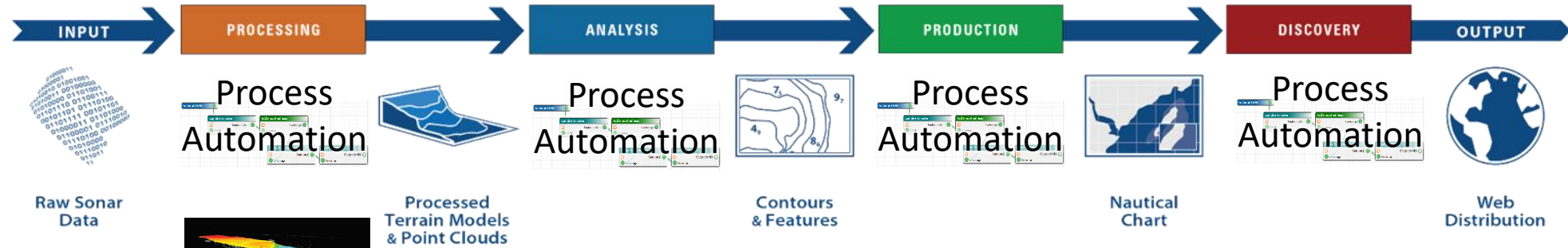


New: Deep Learning Sonar Noise Classifier add-on to CARIS HIPS

- Recognize patterns in survey data
- Automatically locate, classify, and remove noise
- Currently in Beta
 - Beta testers positive – Appears to save a lot of time



CARIS Ping-to-Chart Workflow

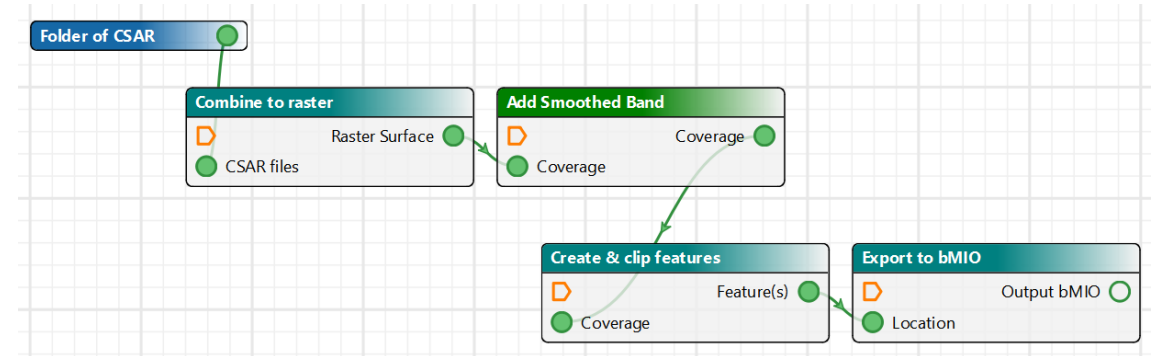


PROCESS AUTOMATION

Summary

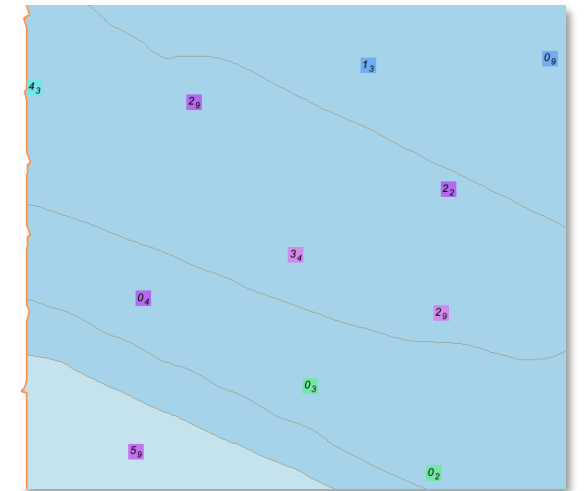
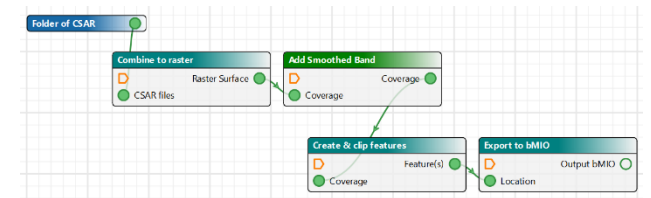
PROCESS AUTOMATION

- Gain efficiencies
- Secure constant quality
- Improve production capacity
- Automate
 - Processing
 - Analysis and certification
 - Production
 - Distribution



ACCEPTANCE

- Give users sense of control – also when predefined rules are used
- Make the process - and the results - transparent
- Make it easy to modify the results - also interactively



BUILD CONFIDENCE



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