

Paper for Consideration by WENDWG14

IC-ENC S-100 Services

Submitted by:	IC-ENC
Executive Summary:	This paper provides the overview of IC-ENC S-100 Services, for information to WENDWG
Related Documents:	IHO S-100 Implementation Strategy
Related Projects:	n/a

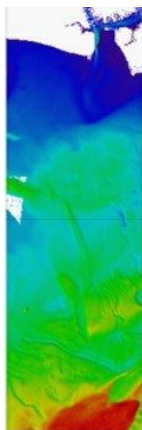
Introduction/Background

In support of the IHO Roadmap for the S-100 Implementation Decade (2020 - 2030), IC-ENC is developing end-to-end S-100 services which include data upload, ingest and registration, validation, and distribution of S-100 Maritime Data Products. Initially, IC-ENC has focused on S-101, S-102, S-104, S-111 and S-122 as its first-generation S-100 services, as agreed with Members. IC-ENC plans to identify/develop the next generation of S-100 services through further Member engagement.

Analyses/Discussion

IC-ENC S-100 Services to Members

IC-ENC has developed the following first-generation S-100 services for its Members, this has been a step change from the existing S-57 Validation service, with different data formats and frequency of data. IC-ENC has also developed S-1XX Registration Checks (while the IHO standards continue to evolve) to perform checks on the S-1XX data and provide important feedback to Members.



First generation IC-ENC S-10x services:

- S-101 - Electronic Navigational Chart (ENC)
- S-102 - Bathymetric Surface Product
- S-104 - Water Level Information for Surface Navigation
- S-111 - Surface Currents
- S-122 - Marine Protected Areas
- Conversion Readiness Service
- S-128 - Catalogue of Nautical Products (generation on behalf of Members)

All S-1XX data is managed via the IC-ENC Data Management Database (DMD), where Members can upload their data to a secure FTP, and the DMD then runs a set of Ingest and Registration Checks before registering each dataset as a unique cell work item. From there, the main validation process is conducted. Once a dataset has passed validation and set to 'ready for release', it can be included in a data release cycle and made available to the IC-ENC VAR network.

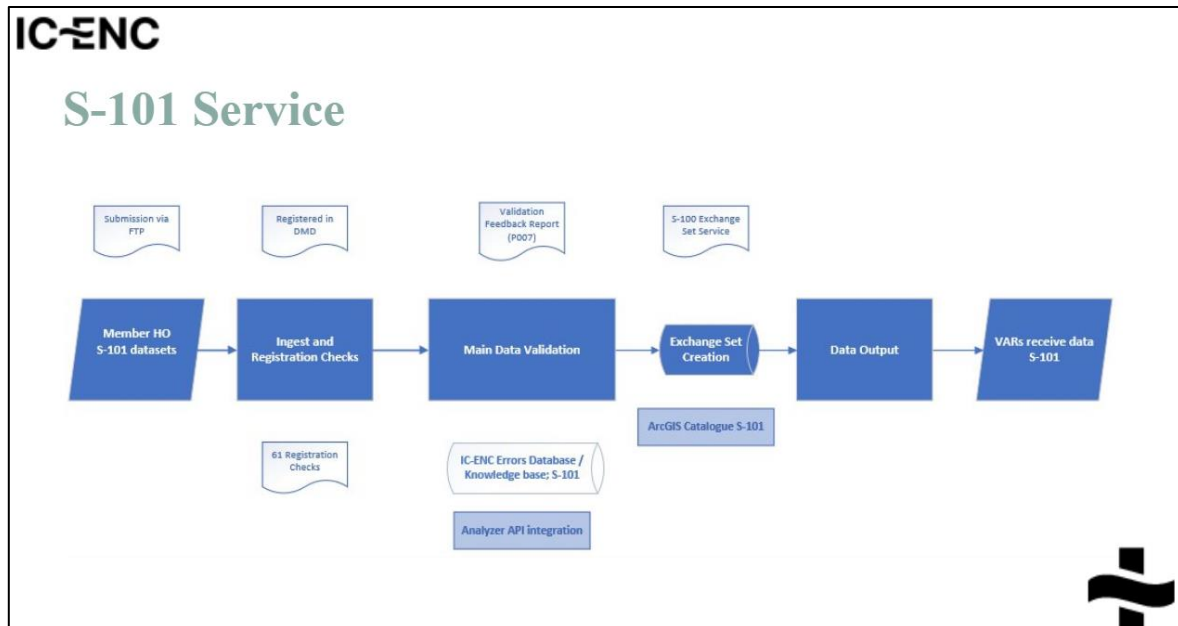


Figure 1 - S-101 Service Process Flow Diagram

To support the dynamic nature of S-104 and S-111, the end-to-end process has been automated so that no manual intervention is required from data ingest through to data release.

Conversion Readiness Service

IC-ENC is providing a Conversion Readiness Service to its Members to ensure that S-57 ENC's are optimised for conversion to S-101. This service includes the following components:

- A set of conversion readiness checks, performed on all base cell (new edition, new cell) validations, with recommended action provided in the validation feedback report. "Conversion readiness" feedback has been provided on 9,690 base cell validations since the checks were introduced in July 2022
- Sample S-57 to S-101 conversion assessments - conversion of a sample size of a Member's ENC folio to provide an overall picture of "conversion readiness". These assessments were formally offered to Members at the start of 2024, and so far, IC-ENC has completed seven assessments. This has been a great opportunity to get the Validation Team involved and building their knowledge of S-100, specifically S-101 as we prepare for the "dual fuel" period.
- S-101 trial dataset assessment – this is the assessment of S-101 trial datasets sent to IC-ENC, with feedback provided in a report. This includes validation against S-101 ingest and registration checks and SevenCs Analyzer, followed by loading into COTS tools and S-100 Viewers, S-57 vs S-101 comparison checks and finally an assessment report for each dataset with findings/recommended action to take. To date, 74 S-101 trial dataset assessments have been completed.
- S-100 validation tool testing - to provide Members with an overview of the main S-100 validation tools so that they can make an informed decision on which software tools to use for their S-100 production.
- S-100 Knowledgebase - to provide conversion and validation errors from S-100 COTS tools for Members to refer to.
- Technical Conference (TC) - subgroup of the Steering Committee, which fully embraces our community ethos and provides IC-ENC S-100 service/Industry S-100 production tooling updates to Members and for Members to share S-1XX production experiences across the membership.

Trials/Testbeds

IC-ENC plays an active role in S-100 trials and testbeds, including:

- Contributing to the development of IHO S-164 test datasets

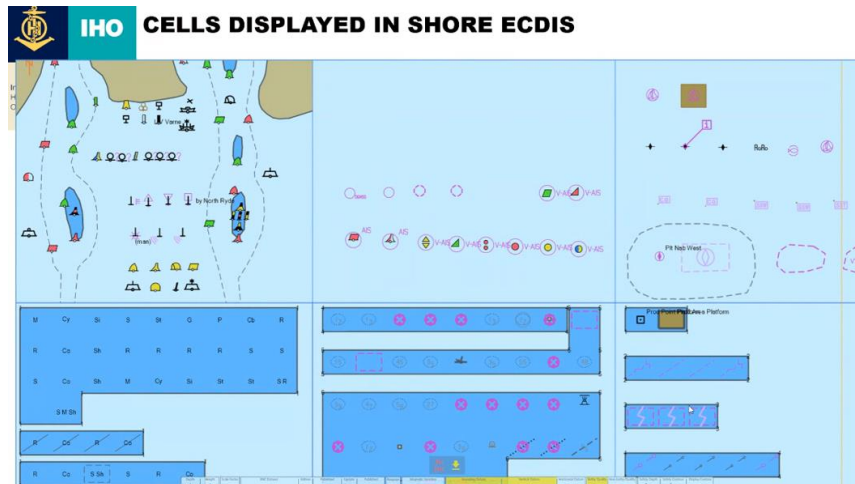


Figure 2 - S-164 test datasets

- S-101 trial with Netherlands HO (NLHO), enabling NLHO to test their S-101 production processes and enabling IC-ENC to test its end-to-end S-101 Service. The results from this trial will be presented at the next IC-ENC Technical Conference in March 2024
- Support to the Baltic Sea E-Nav Project, particularly for IC-ENC Members Denmark and Germany which includes provision of IC-ENC's Conversion Readiness Service

S-128 (Catalogue of Nautical Products) Service

IC-ENC's S-128 Service was decided upon by Member engagement. This included a vote at TC where there was 100% support for IC-ENC to generate S-128 datasets at S-57 and S-1XX release on behalf of Members. This means that Members will not need to provide S-128 datasets when uploading data to IC-ENC. This capability has since been incorporated into the DMD, and an S-128 dataset is generated at every data release cycle. This will provide Members and VARs with an S-128 dataset for each product type which is maintained and updated.

A joint RENC paper with PRIMAR was also written for WENDWG13 to confirm the RENCs' position on S-128.

The next step for the IC-ENC S-128 Service is to introduce the capability for the DMD to generate custom S-128 datasets, such as per Member or a delta (i.e. changes rather than cumulative).

S-100 Validation

IC-ENC uses COTS tools and S-100 Viewer tools to validate S-1XX datasets. This currently includes:

- IC-ENC DMD Ingest and Registration Checks for S-57 and S-1XX product types
- S-101 Validation checks (based on S-58 checks)
- S-57 vs S-101 comparison checks
- S-57 and S-1XX coverage checks
- S-57 and S-1XX overlap checks

S-100 Exchange Set Generation

IC-ENC can generate S-100 exchange sets and digitally sign the datasets so that they are compliant with S-100 Part 15. This capability has been integrated into the DMD via an API tool, and so each time an S-1XX release is scheduled, the API is called and generates a signed S-100 exchange set for onward distribution.

Product Development & Testing Licence

IC-ENC has developed a Product Development & Testing (PDT) Licence which provides organisations (and more recently HOs) with access to S-1XX test datasets produced by IC-ENC Members, which can be used for research and development purposes. The S-1XX test datasets are available to download from a data portal, which is accessible only by those who have signed the PDT Licence Agreement. Currently, 30 Members and 5 companies are opted into the PDT Licence.

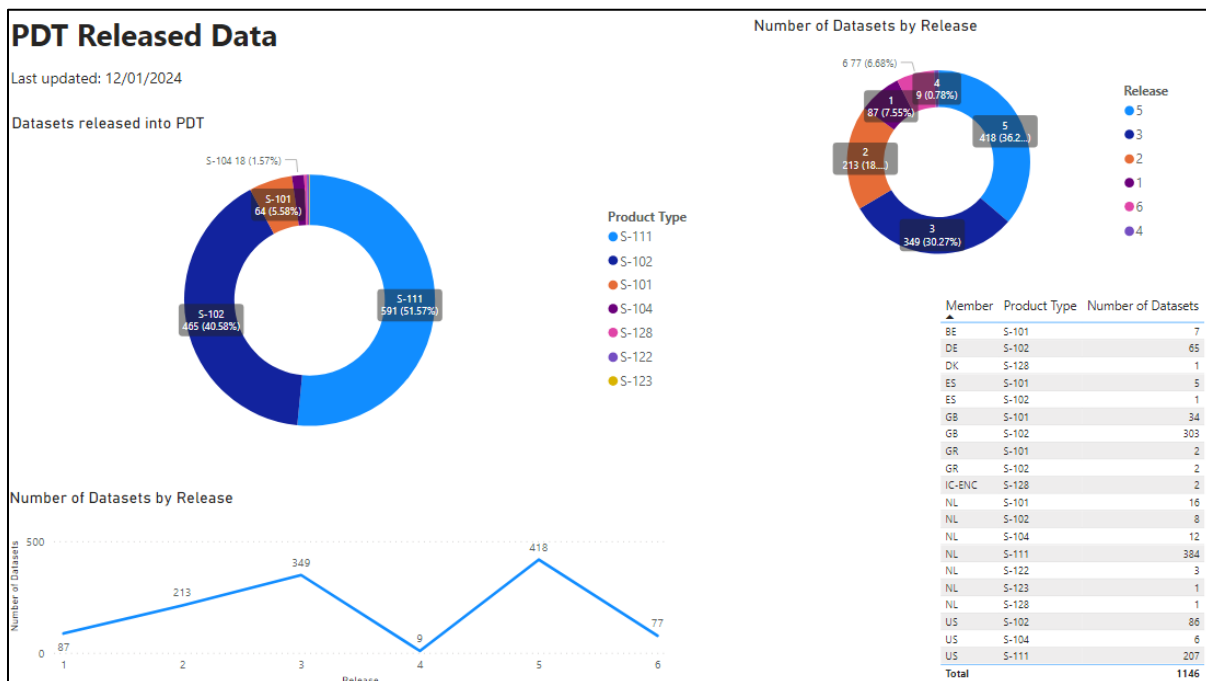


Figure 3- IC-ENC PDT Released Data Statistics

In addition, a formal feedback loop has been established to help IC-ENC understand how the PDT Licence is utilized by PDT Users. The first set of interviews took place in Q3 2023 where an independent researcher conducted interviews with PDT signatories to gain feedback on the S-1XX datasets released under the PDT scheme so far. This has helped IC-ENC to:

- Understand how PDT Users are utilizing the datasets
- Gain feedback on the quality of the PDT service itself
- Provide Members with technical feedback on their datasets
- Provide feedback to relevant IHO Working Groups to support standards development

The next round of feedback interviews are planned for end of Q1 2024.

For more information, please visit <https://www.ic-enc.org/pdt-licence>.

S-100 Graphical Catalogue

IC-ENC has an S-100 Graphical Catalogue available which shows all S-1XX data currently released under the PDT Licence. Users can view dataset coverage and metadata for different product types.

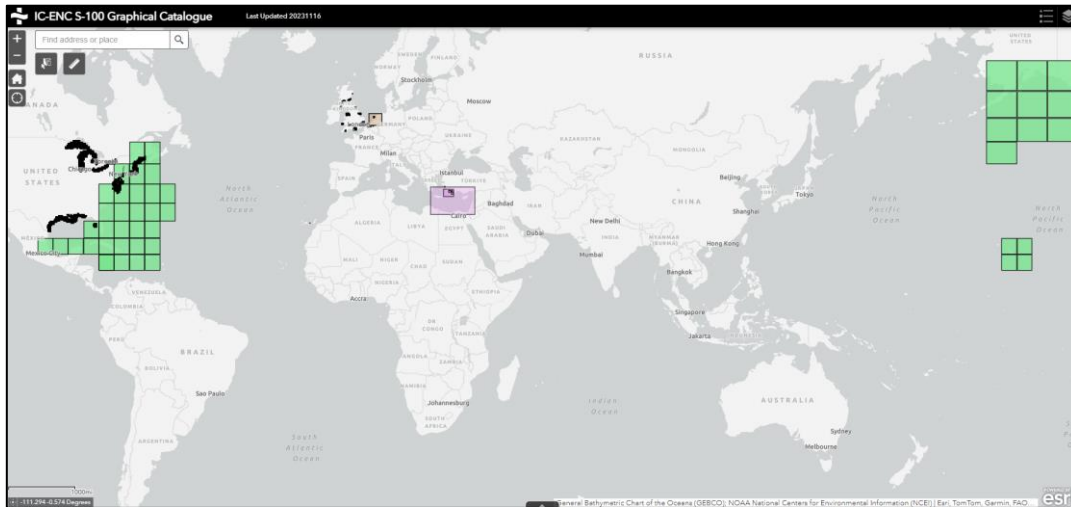


Figure 4 - IC-ENC S-100 Graphical Catalogue (available at <https://www.ic-enc.org/our-coverage>)

S-100 Production Support/Training

- IC-ENC has a Learning Management System (LMS) with a variety of training materials available to Members, including:
 - S-57: ENC gridding, HD ENCs and rescheming best practice
 - S-100: Introduction to S-100 course, S-57 to S-101 conversion course, conversion readiness checks, S-57 and S-101 differences. Further S-100 training is in development
 - Member material – information shared by Members, reviewed by IC-ENC and uploaded to the LMS
 - LMS access can be granted for non-RENC Members
- S-57 ENC Validation Training Courses - 5-day in person training events delivered by IC-ENC
- S-57 to S-101 Conversion Workshops throughout 2024 - 4-day face-to-face workshop style events supported by IC-ENC
- Members can also request bespoke support from IC-ENC
- Technical Conference - community ethos across 50 Members and sharing of experiences amongst the Membership
- For more information, please visit <https://www.ic-enc.org/production-support> , <https://www.ic-enc.org/lms> , <https://www.ic-enc.org/lmscourses>

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Conclusion

IC-ENC has developed the first generation of S-100 services, S-101, S-102, S-104, S-111, S-122, and S-128 generation with four key goals in mind:

1. Member engagement, ensuring IC-ENC supports its Members with their S-100 prioritisations.
2. Community ethos in sharing production experience, recognising that across the IC-ENC Membership, Members are at different stages of their transition to S-100, and no-one is left behind.
3. Close alignment with the IHO Phase 1/ Route Monitoring prioritised product types.
4. Increasing automation whilst continuing to provide value add to Members.

IC-ENC is proud to support its Members in their S-100 transition and the IHO with the S-100 Implementation Strategy, and continues to develop S-100 services through Member engagement.

IC-ENC as a RENC will be capable to distribute to its VARs both S-57 and digitally signed S-101 ENCs to support the “dual fuel” model, as mandated in Section 3 of the IHO Roadmap for the S-100 Implementation Decade (2020 -2030).

Action required of WENDWG14:

The WENDWG14 is invited to:

- a. Note this report.