

Roadmap for the S-100 Implementation Decade (2020 – 2030)

Version 3.0, October 2023

- References:
- A: Decision A2/29: endorsement by the Assembly of version 1.0 Rev1 following Proposal A2/2.1
 - B: List of actions and decisions from 2nd Meeting of IHO Council (C-2) 2018
 - C: List of actions and decisions from 3rd Meeting of IHO Council (C-3) 2019
 - D: List of actions and decisions from 4th Meeting of IHO Council (C-4) 2020
 - E: List of actions and decisions from 5th Meeting of IHO Council (C-5) 2021
 - F: HSSC13 Report to IHO Council (C-5)
 - G: IRCC13 Report to IHO Council (C-5)
 - H: IHO Report to IMO (NCSR8/13/1 dated 09 February 2021)
 - I: IHO Resolution 1/2021 – WEND 100 Principles
 - J: Decisions and Actions IHO Council (C6/32 to /36, October 2022)
 - K: Decision A3/13 Dual Fuel Concept for S-100 ECDIS
 - L: Decision A3/14 S-100 Infrastructure Center

Introduction

The Roadmap for the S-100 Implementation Decade (2020-2030) constitutes a transition plan aiming to the regular and harmonized production and dissemination of S-100 based products. The referenced Meetings of the IHO Council confirmed repeatedly the decision to task the chairs of the Council, HSSC, IRCC and the Secretary-General, supported by subject matter experts and Member States as appropriate, to maintain the Roadmap as an incremental version-controlled document (including narrative and timelines) on an annual basis.

This task includes the mandate of the Secretary-General to engage with the IMO to regularly update on the status of the S-100 framework and potential future impact on IMO instruments (Ref. B: Action C2/32).

Based on the evolutionary process made with the subject matter under the auspices of IRCC and HSSC since C-2 in 2018 and in view of the recent Decisions made by A-3, the noted group of office bearers decided to review this document which now includes endorsed amendments as proposed by HSSC as described in Annex 2 of the HSSC report and by the WENDWG as contained in Annex A of the IRCC report to C7. The structure of Version 2.1 of the document remains unaltered for Version 3.0:

1. Operational infrastructure
2. Technical standardization
3. Coordinated implementation of services
4. Synchronization with IMO
5. Collaboration with industry
6. Capacity Building of Hydrographic Offices
7. Development of Global Distribution Capability

Version 3.0 also include four Annexes as follows:

Annex 1: Collaboration and timelines with IMO and other liaising organizations to incorporate S-100, in their respective instruments as presented by means of the various reports to C-5;

Annex 2: Detail on S-100 Implementation Priorities, S-100 Timeline for the prioritized IHO Product Specifications and Options for HOs for Parallel Production of S-101 and S-57 ENC's;

Annex 3: WEND-100 Principles - IHO Resolution 1/2021 - *Principles of the WEND for S-1XX Products (WEND-100 Principles)*.

Annex 4: Dual Fuel Concept for S-100 ECDIS (version 1.0, May 2023, as approved at 3rd Session of Assembly, Decision A3/13) - Executive Summary & Full Report

Analysis and Discussion

1. Operational infrastructure

Operational infrastructure such as the IHO Geospatial Information Registry and tools such as the Feature Catalogue Builder and Portrayal Catalogue Builder to compose product specifications is ready for the ongoing maintenance of S-1xx product specifications **since 2021** (IHO SEC – HSSC) but requires ongoing improvement due to forthcoming revisions of the S-100 technical framework. The 3rd IHO Assembly decided to strengthen the structure for S-100 through a coming establishment of an IHO S-100 Infrastructure Center (Decision A3/14). HSSC was tasked to propose how such an establishment could be achieved.

2. Technical standardization

Detail on S-100 Implementation Priorities, S-100 Timeline for the prioritized IHO Product Specifications and Options for HOs for Parallel Production of S-101 and S-57 ENC's is provided in Annex 2.

The S-100 framework and the Product Specifications based on it are not developed and maintained in isolation. Numerous international organizations collaborate actively with the technical bodies of IHO to develop and apply S-100 based products to their respective regulations and services. Annex 1 contains an overview of the collaborating partners.

3. Coordinated implementation of services

S-101 ENC:

- S-101 ENC coverage should grow faster than S-57 ENC in its early days since the relevant concept model (objects featured with geometry and attributes are linked to specific presentation rules given by S-52, encoding remains ISO-IEC8211) is identical and distribution concepts for ENC's via RENC's and national services are in place.
- For the ignition phase conversion of S-57 ENC's to S-101 ENC's can help to reach significant coverage, knowing that there will be limitations of those converted cells in some cartographic details in comparison to the full range of S-101 ENC's native features.
- In order to maintain ECDIS devices already installed on SOLAS vessels which are technically not ready nor required to be upgraded to S-101 ENC process capability and to

be in line with the applicable IMO regulations pertaining to existing navigation equipment, identical coverage has to be provided for S-57 ENC and S-101 ENC for a transition period. The IHO will assess the progress of the transition in collaboration with IMO and industry stakeholders. If the results indicate that there will be widespread and substantial residual dependence on S-57 ENCs, limited provisions will be made to extend the period to ensure an orderly transition.

- As a consequence, new ECDIS systems to be brought into the market at the time when S-101 ENC coverage starts (2025) will have to be capable to process both formats: S-57 ENCs and S-101 ENCs in parallel.
- This “dual fuel” model is instrumental for the transition period. From the user’s perspective, presentation of cartographic features to meet the IMO mandated content (ENC = official nautical chart) should be seamless and presented under the identical presentation regime. For details see Annex 4.
- In order to accomplish this phase of transition on the data production and data distribution side:
 - o It is proposed to seek commitment from as many as possible IHO MS to start **regular native production of S-101 ENCs in 2025 and regular availability gradually growing in the course of 2026** in parallel to regular S-57 ENC production.
 - o RENCs and VARs must be capable to feed the market with the S-101 ENCs – including encryption aspects and be ready for a mixed distribution arrangement to support the “dual fuel” model.

Additional S-1xx Product Specifications:

- It is anticipated that these additional services will be offered at a variety of timeframes globally, so that coverage will be discontinuous. It is not anticipated that these services will be mandated by IMO, but will be available at the option of users through compatible systems.
- However, these datasets are anticipated by shipping industry for specific applications in national waters and specific regions.
- The navigation equipment industry stands ready to make use of these products as soon as regular provision of such datasets is provided for areas of substantial size and importance.
- There is no need for industry to wait for the final implementation of an S-101 ENC enabled S-100 ECDIS. Additional S-1xx products can be used in existing, non-type approved systems, with upgrades to software for those clients who wish to use them. (IEC)
- IHO via IRCC will create and maintain a global catalogue of services and planned services on a regular basis and encourage them to start service provision via RENCs or individual arrangements. (IHO SEC)
- Some services may only be of attraction for customers where regional cover has been established. Coordination of regional approaches via the respective RHC is desired. (IRCC)

Additional S-Xxx Product Specifications developed and maintained by other domains:

- A regular data service for S-411 Sea Ice is provided via the JCOMM Ice Logistics Portal for the World regions: Southern (Antarctica), Northern 90W (Western Arctic, Canada and the Great Lakes) and Northern 90E (Eastern Arctic, Baltic Sea and parts of the Pacific Sea) (https://www.bsis-ice.de/IcePortal/ILP_S411.shtml). The WMO is also working with a product specification for Weather and Wave Hazards, S-412.

- IEC has developed a product specification for Route Plans, S-421, which will be included in the IMO ECDIS Performance Standards with the same transition period as S-100 ECDIS. Endorsed by IMO NCSR10 2023, but depending IMO MSC approval May 2024.

4. Synchronization with IMO

S-101 ENC:

- Having defined a target date for regular provision of S-101 ENC with significant coverage by 2026, IHO initiated a change in IMO instruments: (IHO SEC)
 - o Amendments were made in IMO's ECDIS Performance Standards to incorporate S-100, approved by MSC in November 2022. S-100 ECDIS can be used voluntary from 1 January 2026 and will be mandated in new installations from 1 January 2029.
 - o IHO will assure IMO that the concurrent provision of S-57 ENCs and S-101 ENCS will remain through the transition period.
 - o IHO will assure IMO that S-57 ENCs and S-101 ENCs both fulfil the requirements for ENC as defined in IMO ECDIS instruments and are both suitable for use during the transition period
 - o IHO has clarified for IMO that S-101 ENCs (in contrast to S-57 ENCs) are cyber secure, improve the clarity of portrayal, and open the door for the implementation of the e-navigation service concept (S-100 is the adopted data model for e-navigation).
 - o IHO will provide an annual status report to IMO NCSR regarding the development of the applicable S-100 product specification and specifically the coverage of S-101 ENC, but in addition also coverage of other navigational S-100 layers.

5. Collaboration with industry (IHO SEC)

S-101 ENC:

- Confirmation to be obtained from nautical cartography software industry when S-101 ENC production systems and validation tools will be ready and training can be provided.
- ECDIS industry is aware of the start date of S-101 ENC provision service in 2026 to be prepared to read S-101 ENC (including encryption) and maintain consistent performance (Display, Alarms, update etc.) in new ECDIS equipment.
- Close cooperation with IEC to adapt IEC61174 for S-101 ENC, and other applicable S-100 layers, based tests.

Additional S-1xx Product Specifications:

- ECDIS and other GIS industry has to be made aware that provision of such datasets starts according to individual commitment of MS or regions. IHO will play a coordinating role, through the RHCs by encouraging MS to set up such services on one hand and informing ECDIS and other GIS industry about the progression. (IRCC)
- The IHO Member States should respect the IMO Resolution on Performance Standards for ECDIS and the in force dates agreed upon, understanding that not only adequate S-101 ENC coverage and but also appropriate complementary S-100 data/products services are expected when S-100 ECDIS becomes operational.

Additional S-Xxx Product Specifications developed and maintained by other domains:

- Such Product Specification will be proven compliant with S-100 and ready for interoperability through registration under their respective domain of the IHO Geospatial Information Registry. It can be expected that industry will develop compatible applications

not limited to ECDIS and surface navigation. There is a relevant group of potential users in the entire maritime domain to be commercially addressed by these products.

6. Capacity Building for Hydrographic Offices

- The CBSC, tasked by the IRCC, should develop a procedure to assess the needs and assist hydrographic offices with the transition of ENC production to S-101. CBSC should also consider activities to raise awareness on the benefits for producer nations.
- As new services are matured for S-1xx services (besides S-101), and relevant production and quality systems are developed, those producer nations with technology and expertise are encouraged to share these within the framework of IHO Capacity Building strategy, the respective RHC or bilaterally to support the growth of these services.

7. Development of Global Distribution Capability

- The coordinated global distribution capability relies on the application of structural principles aiming to ensure a world-wide consistent level of high-quality, updated official S-1xx products through integrated dissemination services which should be available for mariners, and to all other users supporting maritime activities.
- These principles have been developed as WEND-100 Principles (See Annex 3 – IHO Resolution 1/2021 as per Reference I). The application of these principles envisions a new generation of global service delivery networks, analogous to the current RENC arrangements, which will enable convenient global availability of authoritative services. These networks will need to consider:
 - The wider variability of perishability of these services, and the necessity for very low latency for dynamic services.
 - The need to manage the availability of S-101 and S-57 ENCs simultaneously, in combination with other interoperable S-100 compliant data services belonging to the hydrographic or alternative domains.
- The work to implement the WEND-100 Principles has started in parallel, and the following complementary Guidelines are in preparation (as of June 2021):
 - S-101 ENC Scheming Guidelines
 - S-1xx Implementation Guidelines.