S-100 Product Specification Roll Out Implementation Plan

Introduction

This intent of this plan is to provide status, challenges, timelines, and strategies for the suite of S-100 products under development by the IHO. While there are a number of named product specifications, only a subset are currently under active development. The IHO has developed and adopted Technical Resolution 2/2007 as the formal standards development lifecycle, which provides a general guideline that is followed in the standards approval process.

Principles of S-100

S-100 provides a contemporary hydrographic geospatial data standard that can support the variety of hydrographic-related digital data sources, products, and customers. Its main features include:

- Separating the data content from the carrier (file format). In this way, data can be manipulated and encoded without being permanently tied to a single exchange mechanism.
- Manageable flexibility that can accommodate change. The content of product specifications will be a subset of S-100, including separate feature catalogues. This allows the core standard to evolve (through extension) without the need to introduce new versions of product specifications.
- Alignment with the series of current geospatial information standards adopted by the International Organization for Standardization (ISO 191xx). This ensures compatibility, or interoperability, with other domains.
- An ISO-conforming web-based registry containing registers for feature data dictionaries, portrayal and metadata. The registers accommodate both core hydrographic content and other chart related content and can be extended beyond geospatial data. The registry architecture also contributes to the flexibility of the standard.

S-100 specifies, for hydrographic and related information, methods and tools for data management, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. By following, this set of standards users will be able to build constituent parts of an S-100 compliant product specification.

Most S-100 based product specifications include the following components which provide the structure to define and portray real-world features for a wide variety of maritime and geospatial applications.

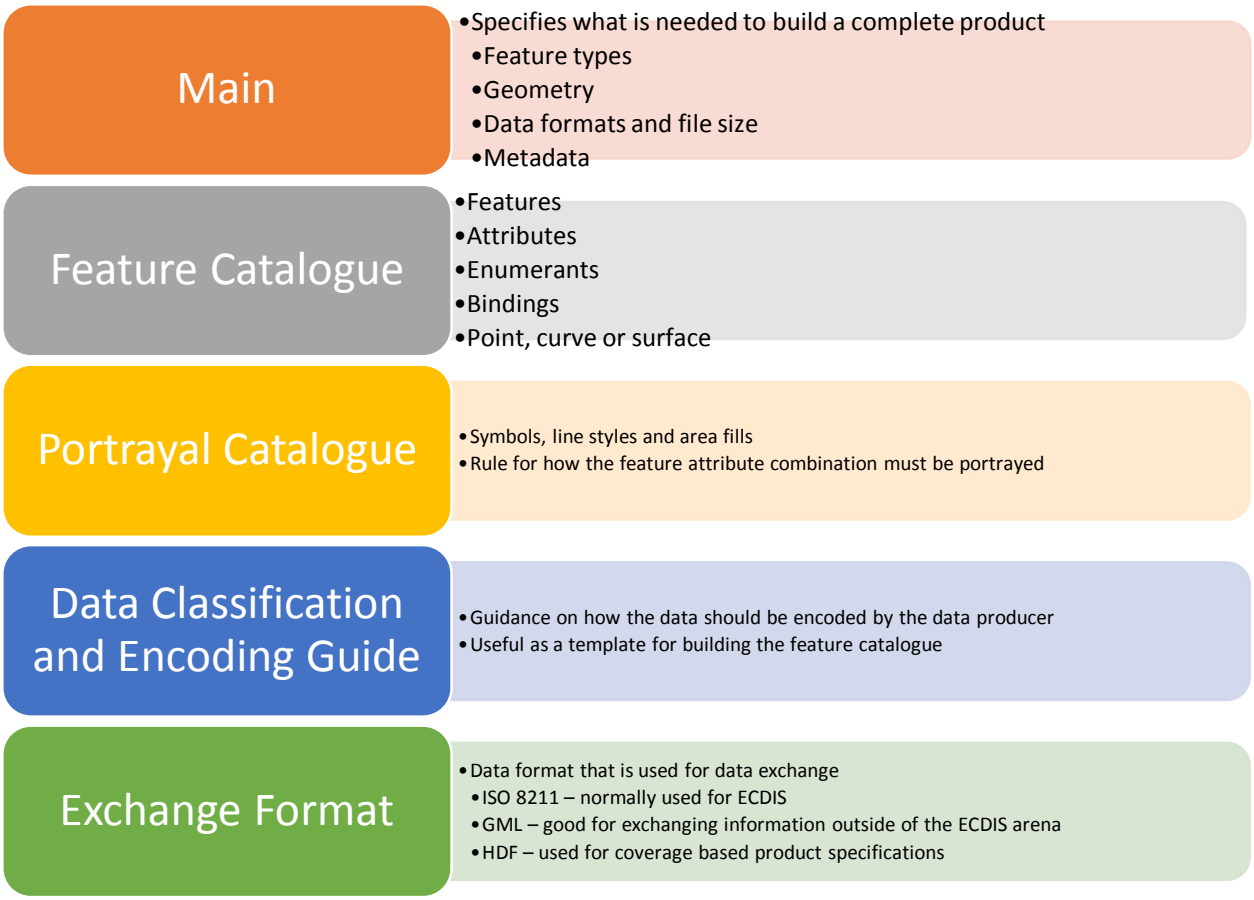
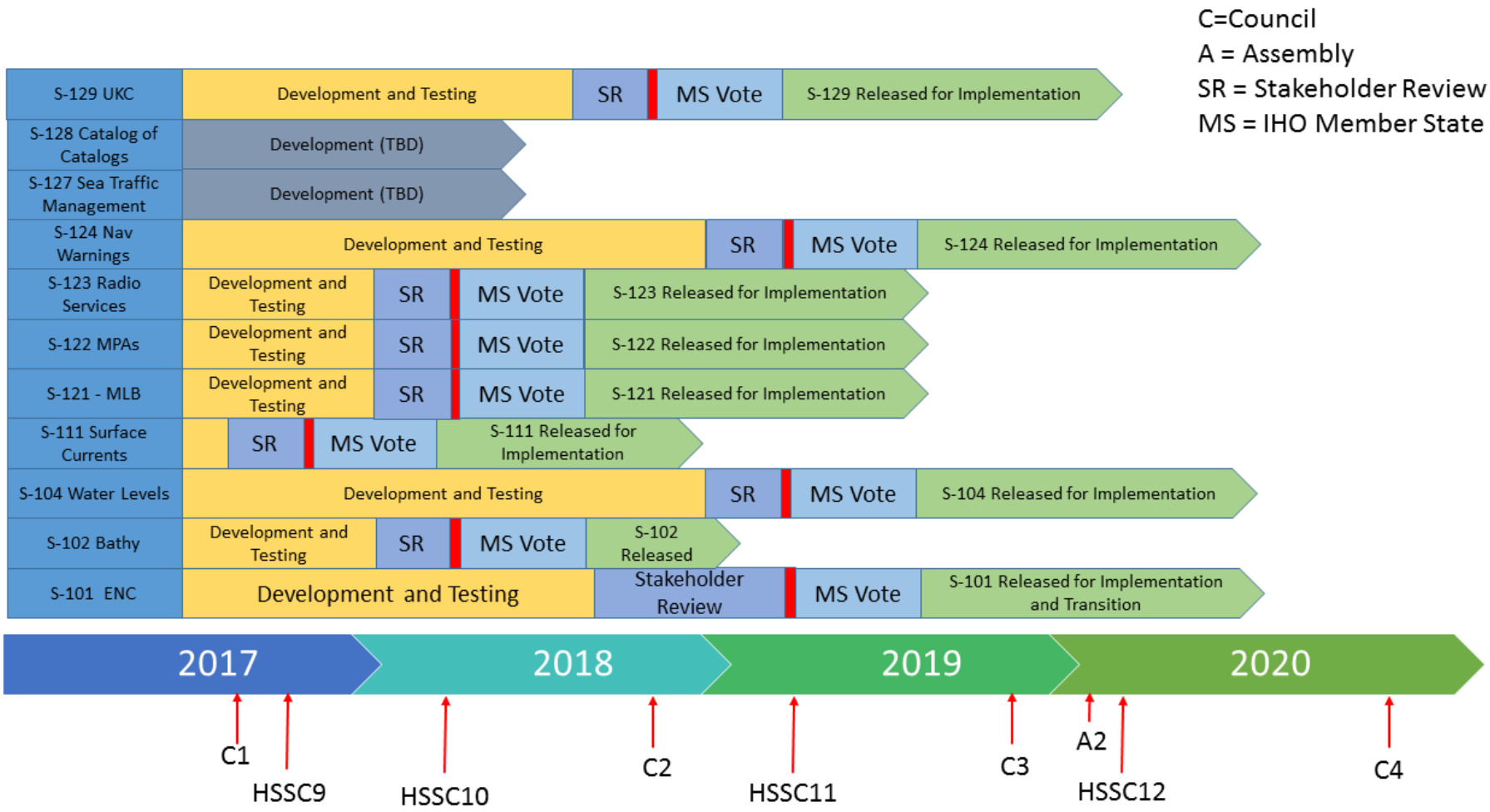


Figure 1- Components of an S-100 Product Specification

Overarching Request: NOAA was able to contract two experts for four months to help progress some of the underlying tasks that needed resourcing to be progressed. This has been a great help in providing updated data models for various specifications and completing the initial draft of the S-100 interoperability specification that was originally started using NOAA/ROK grant funds. The funding used for this has run out, so there is currently no way to extend contract resources. In order to continue progress, a reliable, uninterrupted funding stream is necessary.

Consolidated Timeline:

The following graphic shows the array of various IHO product specifications under development and a general target when they may come up for vote by the IHO MS.


C=Council
A = Assembly
SR = Stakeholder Review
MS = IHO Member State
S-129 UKC
Development and Testing
SR
MS Vote
S-129 Released for Implementation
S-128 Catalog of Catalogs
Development (TBD)
S-127 Sea Traffic Management
Development (TBD)
S-124 Nav Warnings
Development and Testing
SR
MS Vote
S-124 Released for Implementation
S-123 Radio Services
Development and Testing
SR
MS Vote
S-123 Released for Implementation
S-122 MPAs
Development and Testing
SR
MS Vote
S-122 Released for Implementation
S-121 - MLB
Development and Testing
SR
MS Vote
S-121 Released for Implementation
S-111 Surface Currents
SR
MS Vote
S-111 Released for Implementation
S-104 Water Levels
Development and Testing
SR
MS Vote
S-104 Released for Implementation
S-102 Bathy
Development and Testing
SR
MS Vote
S-102 Released
S-101 ENC
Development and Testing
Stakeholder Review
MS Vote
S-101 Released for Implementation and Transition
2017
2018
2019
2020
C1
HSSC9
HSSC10
C2
HSSC11
C3
A2
HSSC12
C4

S-101 – The new Electronic Navigational Chart Specification

Working Group	Target to HSSC	Target to MS	Implementation
S100WG	HSSC 11 (2019)	3rd Quarter 2019	4th Quarter 2019

S-101 represents the evolution of S-57 based ENCs by taking advantage of the flexibility of the IHO GI Registry. The changes introduced by S-101 will be transparent to the encoders of ENCs. The largest percentage of features and attributes remain unchanged, but there will be a need to change the techniques used where information types and complex attributes are introduced. In addition, S-101 introduces the concept of a cartographic text feature, where parameters stored within hydrographic office production systems can be directly passed to the dataset and then displayed on the navigation system in a similar manner as the paper chart.

Current Challenges: The biggest delay to the development of S-101 is the need to stabilize the infrastructure that is required to develop S-101 machine-readable catalogues. The Feature Catalogue Builder has been stabilized and the S100WG is working to operationalize and stabilize the portrayal catalogue builder.

Challenge Mitigation: The S100WG Chair is the Project Team Lead for S-101 and is unable to devote time (as the chair is focused on S-100 infrastructure) to progressing this further. It is recommended that the IHO find another volunteer who can focus effort on S-101 (either through the interagency delegation or another Member State). The ideal candidate is someone that has excellent project management skills and has the support of their management to devote time to progressing this over the finish line.

S-102 – Bathymetric Surface Edition 2.0.0

Working Group	Target to HSSC	Target to MS	Implementation
S100WG	HSSC 10 (2018)	3rd Quarter 2018	4th Quarter 2018

Edition 1.0.0 of S-102 was initially published in April 2012 as the first product specification to standardize the Bathymetric Surface using the S-100 framework. In the subsequent time, this edition is considered a "shakedown" edition for implementation and edition 2.0.0 is currently in development. The next edition of S-102 will include options for the portrayal of the data on navigation systems, variable resolution grids and improved discovery metadata.

Current Challenges: NAVO is working on developing a BAG to S-102 convertor to support interoperability testing. At its completion, the converter will be handed over to the IHO for dissemination to the IHO community. NOAA has not investigated developing a similar convertor for our data. Work needs to be done with software vendors like Esri and Caris to ensure that the new standard is used during database extraction and is part of their COTS tool kit.

S-104 – Water Level Information for Surface Navigation

Working Group	Target to HSSC	Target to MS	Implementation
TWCWG	HSSC11 (2019) at the earliest	3rd Quarter 2019	4th Quarter 2019

S-104 is meant to be used for the encapsulation, data transfer of tidal and water level data for use within navigation systems (ECDIS), or any proposed dynamic tide and water level prediction application. These have traditionally been supplied as a physical hard copy publication and recently as a separate software installation that may not be integrated with the ECDIS. To improve safety of navigation, this product specification will ensure tidal and water level data supplied by approved authorities for dynamic capability is consistent..

Current Challenges: TWCWG has subject matter expertise in how to calculate water levels; however, they do not have the expertise to develop the S-100 data models.

Challenge Mitigation: NOAA offered TWCWG some contract support in the summer of 2017 to help develop the underlying data models for S-104; however, that is only a short-term solution. There needs to be a commitment to include an S-100 expert in the TWCWG to help operationalize forecast systems in ECDIS.

S-111 - Surface Currents

Working Group	Target to HSSC	Target to MS	Implementation
TWCWG	HSSC9 or 10 (2017/2018)	4th Quarter 2017/2nd Quarter 2018	1st Quarter 2018/4th Quarter 2018

S-111 describes how to define and encode surface currents into an S-100 conformant product specification for use within navigation systems. It includes general information for data identification as well as for data content and structure, reference system, data quality aspects, data capture, maintenance, encoding, delivery, metadata and portrayal.

Current Challenges: The development of this product specification is progressing; but has been slowed by other related S-100 infrastructure that is needed to support S-100 product specifications.

Challenge Mitigation: If the IHO accepts that edition 1.0.0 of any product specification is the stabilization edition, then S-111 could be presented to HSSC9 in 2017 for approval. S-111 does not necessarily need a portrayal catalogue for system manufacturers to implement the ability to read and display surface current data. S-111 currently specifies in a textual manner how current data should be displayed, but is lacking the machine-readable catalogue. The first edition is normally where issues are found during the implementation stage and the second edition is used to correct these issues for a wider release.

S-121 – Maritime Limits and Boundaries

Working Group	Target to HSSC	Target to MS	Implementation
S100WG	HSSC10 (2018)	3rd Quarter 2018	4th Quarter 2018

S-121 describes how to encode and exchange digital maritime boundary information, including maritime limits, zones and boundaries as described under the United Nations Convention on the Law of the Sea (UNCLOS). The specification was developed as part of a request form the UN Division for Oceans and Law of the Sea (DOALOS) that digital datasets submitted for continental shelf submissions should be published in an open source digital standard. The primary purpose of this specification is to support UNCLOS submissions and eventually a secondary purpose could be that the same data could be overlaid in a navigation system to visualize different maritime boundaries that may or may not be a part of the Electronic Navigational Chart.

Current Challenges: There have been several leadership changes during the development of this specification as the individual who was leading the effort took another job. This specification has also experienced scope creep with the introduction of new concepts pertaining to land domain management.

Challenge Mitigation: HSSC8 in 2016 tasked the project team to stick within the original scope. The project team held a face-to-face meeting in late 2016 to progress the work. It is expected that S-121 will be provided to the HSSC in 2018.

S-122 Marine Protected Areas

Working Group	Target to HSSC	Target to MS	Implementation
NIPWG	HSSC10 (2018)	3rd Quarter 2018	4th Quarter 2018

S-122 describes how to encode and exchange information on Marine Protected Areas for use in navigation systems. This specification is intended to provide more details about regulations associated with MPA's than is currently found in the Electronic Navigational Chart.

In order to progress this work the IHO established a contract with industry experts. It is expected to go before HSSC10 in 2018.

S-123 Radio Services

Working Group	Target to HSSC	Target to MS	Implementation
NIPWG	HSSC10 (2018)	3rd Quarter 2018	4th Quarter 2018

S-123 for Radio services describes the availability and reliability of radio stations and services offering navigational warnings and weather forecasts. This includes their service areas, services offered and

instructions for contacting or using these services. The primary use of this specification is to take information that was published in document form and create a vector overlay that can be used within navigation systems.

In order to progress this work the IHO established a contract with industry experts. It is expected to go before HSSC10 in 2018.

S-124 Navigation Warnings

Working Group	Target to Council	Target to MS	Implementation
WWNWS	Council2 (2018)	4th Quarter 2018	2nd Quarter 2019

S-124 is intended to improve the dissemination and integration of navigational warnings within bridge and shore systems via a digital format. This is a unique product specification as it is being developed under the arm of the WWNWS under the IRRC. The primary participant form the United States in this project team is NGA.

S-129 Underkeel Clearance Management

Working Group	Target to Council	Target to MS	Implementation
S100WG	Council2 (2018)	4th Quarter 2018	2nd Quarter 2019

S-129 will describe the key information outputs of shore based UKCM systems, paying particular attention to:

- A time based layer indicating calculated (vessel specific) no-go areas, and
- Critical UKCM waypoints and their associated tidal windows.

This project team is making good progress developing the specification which is expected to be completed in 2018.

S-100 Interoperability Specification

Working Group	Target to Council	Target to MS	Implementation
S100WG	TBD	TBD	TBD

The S-100 Interoperability Specification is currently under development by the S-100WG and has been funded in a large part by the ROK/NOAA Joint Project Agreement. The aim of this specification is to develop a harmonized methodology for different S-100 based product specifications to display and interact in a harmonized fashion on navigation systems.

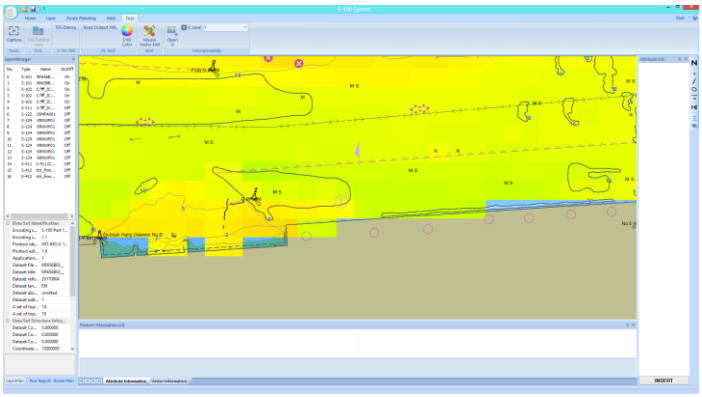


Figure 2- Bathymetry Overlaying an S-101 ENC without taking interoperability into account

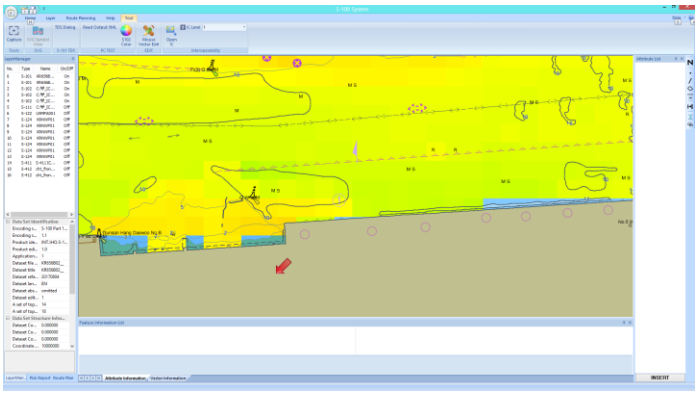


Figure 3 - Bathymetry overlaying an S-101 ENC taking interoperability into account. The Land Area is shown displayed on top of the available bathymetry data.