Paper for Consideration by S-100 WG 5

S-98 Interoperability Way forward

Submitted by:	S100WG Chair
Executive Summary:	Explanatory text regarding the reframing of S-98 Data Product Interoperability Specification Changes
Related Documents:	TSM4.7 Interoperability Scope
Related Projects:	S-100 and S-98

Introduction / Background

The May 2019 the draft S-98 specification for data product interoperability described four levels[1] of interoperability between S-100-based data products, with each level increasing complexity of implementation. At the 4th S-100 Test Strategy Meeting, a paper was submitted to help re-scope S-98 to help mitigate concerns raised by member states regarding the complex nature of S-98. This paper summarizes the way forward as discussed at the TSM meeting and to help facilitate the review of the major changes to S-98.

References

S-98 – Data Product Interoperability in S-100 Navigation Systems (Draft – HSSC11, May 2019). HSSC11-05.1A. At HSSC11 documents page (<https://www.iho.int/mtg_docs/com_wg/HSSC/HSSC11/HSSC11Docs.html>).

S-100 – Universal Hydrographic Data Model. Edition 4.0.0 (December 2018).

Discussion

This paper has been put together to address some of the concerns raised by Member States regarding how S-98 will work in practicality. In addition, since S-98 was first conceived and the initial analysis that defined the different levels of interoperability, it has been determined that S-98 potentially should be "de-scoped" to concentrate on the initial implementation of the S-98 concepts.

The phased implementation of interoperability catalogue scopes may face delays in the current ECDIS maintenance paradigm. All stakeholders should be made aware that a staggered implementation of interoperability is likely to require software updates in user systems already at sea.

The interoperability levels are described below.

- In **Level 1**, feature types from different products, including S-101, are interleaved as specified by display plane and drawing priority information contained in the Interoperability Catalogue. Feature layers from other products may be interleaved with ENC feature layers to prevent ENC data from being obscured.
- **Level 2** allows suppression of all features of a specified feature type in a specified product by a feature type from a different product. Filtering by attribute values and geometry type is also possible. Predefined combinations (PDCs) are introduced, so that the display can be customized for different sets of loaded products.
- **Level 3** allows feature hybridization – enhancement or combination of thematic attributes using rules specified in the Interoperability Catalogue, and treatment of the result as a notionally unified feature for display. Only thematic attributes can be combined in Level 3. For example, re-calculation of values of a numeric attribute or addition of listed values to an enumeration attribute.
- Levels 1-3 assume exact spatial coincidence of interacting features (within system tolerances). **Level 4** drops the requirement for exact coincidence and defines spatially-aware interoperability. Complex spatial queries (INTERSECT, etc.) can be defined to determine related subsets of features, and interoperation results are defined using an adequate set of spatially-capable rules. This means that the interacting feature(s) need not be spatially equal, they need only be related to one another by the spatial query. For

[1] Technically 5 levels are described, Level 0 (no interoperability) is also a level.

hybridization, in addition to thematic attributes, feature geometry can also be combined using spatial operations.

- Formally, there is also a **Level 0** interoperability, defined as turning off all interoperability processing. Layers are allowed, but are treated as whole units and may conceal the features in overlapped sections of lower layers.

Options for Re-scoping S-98n – Selected OPTION

The following options was recommended by the experts at the Test Strategy Meeting as the way forward on S-98 to make it implementable.

1) Incorporate the abstract specification part of S-98 into a new part of S-100 and S-98 stands as an implementation specification

The current iteration of S-98 is a mixture of an abstract specification defining interoperability – such as the structure of an interoperability catalogue and guidance on portrayal for interoperability. At the recent sea trial hosted by KHOA, there was a indepth discussion on how S-98 should be structured and one of the proposals was to split S-98 and absorb the abstract specification and mechanisms into a new part of S-100 and that S-98 itself could be a multipart implementation. For example, there would be one implementation for Front of Bridge Products and a second for Back of Bridge. This would also allow S-98 to become a specification which contains the guidance to tie the various parts of ECDIS (FoB) operation together. It has been pointed out that current elements that are contained within S-52 required for ECDIS do not have a home within the S-100 framework. For example, status report, portrayal framework, loading/unloading (this is in S-101), messages, and others. These elements make up part of the operation of the ECDIS (in the S-57 context) and facilitate the use of the ENC data for navigation while not necessarily being concered purely with its display.

In summary this means:

1. S-100 Part 16 will be created as the abstract specification of interoperability
    a. This part contains the UML model on how to create an interoperability catalogue
2. S-98 Main Document – Describes how the abstract functionalities described in S-100 Part 16 ae encoded and implemented
    a. Systems prove S-100 Part 16 compatibility by proving compliance with S-98
    b. Initial focused on the following specifications for navigation systems interoperability

Specification No.	Title
S-101	Electronic Navigational Chart (ENC) / *Cartes électroniques de navigation*
S-102	Bathymetric Surface / *Surface bathymétrique*
S-104	Water Level Information for Surface Navigation / *Information de hauteur d'eau pour la navigation de surface*
S-111	Surface currents / *Courants de surface*
S-129	Under Keel Clearance Management / *Gestion de dégagement sous la quille*

3. S-98 – Part A/B/C/D – Describes each interoperability level from Level 1 to 4 and will provide the application schema that is specific to each level.

Recommendations

The above way moves the abstract parts of S-98 into S-100 and then keeps S-98 as an implementation of interoperability. In addition, this methodology does not require a distinction between what is needed for planning versus monitoring activities, as S-98 would be applied to both. While, this did require a substantial reworking of S-98 it keeps it in line with the original concept of navigation interoperability. It is recommended that the next steps are as follows:

1. S-100WG review S-100 Part 16, S-98 and its new annexes for comment
2. S-100WG allows the Test Strategy Expert Group to adjudicate any comments for part 16 and S-98
    a. S-100 Part 16 is included in S-100 Edition 5.0.0 (expected publication early 2021)
3. S-98 is finalized at S100WG6 and then forwarded to HSSC13 for approval in 2021

Action Requested of the S100WG

The S100WG is invited to:

1) Endorse the new methodology for S-98
2) Endorse the plan in the Recommendations section of this paper, or define an alternative plan.