



S-98 Interoperability Scopes

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Overview

- This paper covers:
 - Options for defining interoperability scopes.
 - Re-structuring the draft S-98 interoperability specification, including the possible transfer of abstract interoperability concepts into S-100 5.0.0.
 - An assessment of the implications of implementing only Level 1 interoperability.
- Purpose: Facilitate a limited and phased introduction of interoperability, with pauses between phases for evaluation.
- This paper addresses concerns expressed at HSSC 11 and elsewhere:
 - How will interoperability work in practice?
 - Implementation should be phased. Initial efforts should concentrate on the lower, less complex interoperability levels.

Interoperability Levels

- Level 0: No interoperability processing – just overlays, as now.
- Level 1: Interoperability Catalogue (IC) specifies (modifies) the interleaving of feature types compared to the ordering in the PS' Portrayal Catalogues.
- Level 2: Type suppression + filtering + Predefined Combinations (PDCs):
 - Suppression of all features of a specified feature type in one product by a feature type from a different product.
 - Filtering by attribute values and spatial type (point/curve/surface/coverage).
 - PDCs are sets of data products to which a specific collection of interoperability rules apply. PDCs allow customization of interoperability for different sets of data products.
- Level 3: Feature hybridization – enhancement or combination of thematic attributes of coincident features from different products. E.g., re-calculation of numeric attribute values, or adding listed values to an enumeration attribute.
- Level 4: Spatially-aware interoperability. Complex spatial operations for determining whether features interact, combine feature geometry, etc.

Options for S-98

1. Move abstract interoperability concepts into S-100. Retain S-98 as an implementation specification.
2. Use specification scopes (defined in S-100 Part 11) to separate interoperability levels (one S-98 document or Part, with 4 scopes).
3. Divide the interoperability specification into separate documents (or Parts) for separate levels.
4. Add a scope conformance clause with a table specifying which clauses (or Parts) of the revised S-98 belong in each scope.
5. Move Levels 3 & 4 into an informative document.
6. Prepare supporting documents: (a) Functional overview; (b) Implementation roadmap.
7. Change the interoperability specification into a guideline & leave technical details to OEMs.

The options are not all mutually exclusive.

Option 1 – separate abstract interoperability concepts and implementation

- Split S-98 and absorb the abstract specification and mechanisms into a new part of S-100
- S-98 itself could be a multipart implementation.
- Allows S-98 to become a specification which contains the guidance to tie together various parts of ECDIS (front-of-bridge) operation.
 - 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 concerned purely with its display.

Option 2 – Specification scopes

- Adapt the “specification scope” concept from S-100 Part 11 to interoperability levels.
- S-100 Table 11-3 says how the scopes can be described. The table below is derived from that table, and shows how the levels can be described.

Name	Description	Type	Mult.	Value in S-98
scopelidentification	Specific identification of the scope	CharacterString	1	S98LX (X = 1, 2, 3, or 4)
level	Hierarchical level of the data specified by the scope	MD_ScopeCode (ISO 19115-1)	0..1	“software”
levelName	Name of the hierarchy level	CharacterString	0..1	Interoperability Level X
levelDescription	Detailed description about the level of the data specified by the scope	CharacterString	0..1	L1: Interleaving of feature types L2: Type-based selectivity and feature class replacement L3: Feature hybridization L4: Spatial operations
coverage	Subtype of a feature that represents real world phenomena as a set of attributes	CharacterString	0..1	(not used)
extent	Spatial, vertical and temporal extent of the data	EX_Extent (ISO 19115-1)	0..1	EX_Extent.description = “worldwide” EX_GeographicBoundingBox = [-180, +180, -90, +90]

Option 3 – Distinct Parts for each level

- Reorganize the interoperability specification as Parts A-D.
- Each Part contains all the information for a single level in a one compartment, including fragments of the UML model, XML schemas, interoperability portrayal rules, etc.
- Both abstract concepts and implementation could be (separately) sub-divided.
- Compartments provide identifiable references for interoperability levels.
 - E.g., a hypothetical IEC ?????? or IMO MSC ??? can specify interoperability L1+L2 by saying “Implement S-98 Parts A and B.” (or S-100 Parts 16A & 16B).

Option 4 – Scope conformance clause

- Alternative or supplement to option 3 (distinct Parts for levels).
- Add a conformance clause with a table specifying which clauses (or Parts) of the revised interoperability specification belong in each scope.
- This would be largely redundant if Option 3 is accepted.

Option 5 – Make Levels 3 and 4 an Annex

- Describe Levels 3 and 4 in an informative Annex.
- Information pertaining to Levels 3 and 4 should be published, because Levels 3 and 4 address potential problems which are not resolved in Levels 1 and 2.
- Decisions as to whether and when Levels 3 and 4 come into effect can be made later based on experience with Levels 1 and 2.

“Option” 6 – Add supporting documents

- Functional Overview.
 - The draft interoperability functional overview document should be revised to address feedback received and to conform to the final structure of the S-98 1.0.0.
- Implementation Roadmap
 - Some or all dates and intervals can be notional, and fixed as implementation progresses. E.g., in the initial version planned dates for Levels 2 and higher can be notional.

Option 7 – change S-98 into a guideline

- Change S-98 into a guideline of visuals for how interoperability should work on the screen, and leave the technical implementation details to OEMs.
- S-98 becomes a cartographic document that elaborates the priorities for each data object in the described scenarios.
- The guideline would also have to describe if scenarios not described are permissible and how much freedom the OEMs and users would have.
- Type approval like S-64, with IHO supplying test data and reference screen shots and the type approver comparing the image with reference screen shot.

Which levels to implement initially?

- L1 only: In case of similar features in different products, both are on-screen and both are potentially visible and included in pick reports.
- L1 only: Feature layers are either on or off. Feature class with specific attribute combinations cannot be filtered out since filtering is possible only in Level 2.
 - Cannot pick features based on date of survey encoded as a feature attribute.
 - S-111 surface current data can overlap S-101 current information, or S-101 current information can overlap S-111 surface current data, but system cannot filter on type of currents.
 - Without filtering, “ghosting” caused by different compilation scales for similar features in different products is possible.
 - If augmented geometry is different for different data products both geometries might be visible since both levels are “on-screen”.
 - E.g., safety contours from S-101 and S-102.

Recommendations

- Decide if abstract interoperability concepts should be converted into a new S-100 Part 16(?) which contains the guidance to tie together various parts of ECDIS (front-of-bridge) operation.
- Introduce specification scopes and clear documentary separation of content that describes each level (i.e., different Parts for each level, whether in one Word document or multiple documents).
- Prepare “Functional Overview” and “Implementation Roadmap” as supplementary documents.
- Add attributes to S-100 metadata to indicate the specification scopes to which a dataset or catalogue conforms.

Interoperability Levels

