S100WG8-8.1

Paper for Consideration by S-100 WG

S-100 Validation Tests and Cross-Product Validation

Submitted by:	Liz Hahessy (DGA & S-100WG co-vice chair & S-100 Validation sub group lead) & Jonathan Pritchard (IIC Technologies & S-98/S-164 sub group lead)
Executive Summary:	S-100 Validation Subgroup progress outputs
Related Documents:	S-100 Validation GitHub page
Related Projects:	Any S-100 Product Specifications, S-98

Introduction / Background

The S-100 Validation sub working group was established at S-100WG7 in December 2022. Since that meeting work has progressed on producing S-100 Framework level tests for validation by reviewing the S-100 Parts. During these discussions it has become clear there is confusion over what is considered S-100 level checks and what should be at the Product Specification level. There has also been confusion over where Cross-Product Validation Tests e.g. validation between overlapping S-101 and S-102 datasets, intended for use on an ECDIS, should be located and who is responsible for performing them.

For the moment, the S-100 Validation subgroup is only considering datasets that will be loaded and operate on an S-100 ECDIS for navigational use.

Analysis/Discussion

What is "S-100 Level" Validation?

An S-100 Validation Test is referenced to the S-100 Universal Hydrographic Data Model and is therefore independent of any specific Product Specification. This means a validation test can be run against any relevant Product Specification without modification. Not all S-100 validation tests will apply to all datasets, for example, a validation test written for S-100 Part 10c (HDF5 Data Model and File Format) will not be relevant for an S-101 ENC dataset.

This encompasses all elements of the S-100 Framework so includes Datasets, Feature Catalogues, Portrayal Catalogues and the Registry. The aim of the S-100 Validation level checks is to ensure that datasets conform to the S-100 Framework, thus reducing any repetition of tests in individual Product Specifications Validation tests.

Product Specification Validation tests should only contain tests which are unique to that product, for example, when the use of enumerates allowable at S-100 level is constrained by the Product Specification.

What is meant by Validation?

There has been discussion over what is actually meant by the term 'validation' and perhaps this term is no longer sufficient to convey all the aspects that are required for an S-100 age, with multiple products in use.

S-100 Validation is different to existing IHO S-58 Validation Checks as these only apply to one type of product dataset (ENCs) and their corresponding exchange sets. S-58 tests function by a single data set either passing (with accompanying Warnings or Errors) or failing (Critical) individual tests.

For S-100 there are multiple types of validation that can exist, which can be separated by Product Specification and general S-100 level tests.

Product Specification level tests:

1. The dataset itself is valid according to the Product Specification Validation Tests
2. The dataset is valid against datasets of the same product type (e.g. S-101 vs S-101)

S-100 level generic tests:

3. S-100 level Validation Tests (apply to all datasets e.g. Feature Catalogue against Portrayal Catalogue, if a Portrayal Catalogue is present).
4. Tests of individual S-100 components themselves (e.g. whether feature/portrayal catalogues are consistent and conform to the S-100 schemas)

Additionally, there is another type of validation that has not been catered for here, which is whether a dataset is "valid" (or compatible with) another dataset of a different type e.g. S-101 vs S-102, a form of cross-product validation.

Cross-Product Validation

Certain product datasets are designed to be interoperable on an ECDIS, which suggests the need for a new level of IHO validation check to ensure that datasets are safe to use together, in particular the datasets to be used for Water Level Adjustment (WLA), S-101, S-102 and S-104. At the moment, no validation tests exist to check for the safety of datasets which are intended to be used together.

It is currently possible to have an S-101 and S-102 dataset that both pass the S-100 Validation Tests and their respective Product Specification Validation Tests but their content is so different that when used together on an ECDIS they could give misleading or dangerous information. Due to the difference in time taken to produce and update different product datasets it is possible that an S-102 dataset can contain shoaler depths than the underlying S-101 dataset, which is supposed to display the most-safe scenario.

The ECDIS needs to be able to identify which S-101 and S-102 datasets are deemed safe for use together on an ECDIS. Currently there is no mechanism, other than that the Hydrographic Office has released the dataset. This could be further confused for S-104 datasets which may be distributed by different producing agencies.

It is proposed that a set of validation tests, initially focusing on WLA and user selected safety contour are developed and agreed by the Product Specification teams, member state data producers and ECDIS OEMs.

These validation tests will focus on the interoperable use of these products together on an ECDIS for navigational use and will provide guidance to the producing agencies (and possibly RENCs) on when datasets can be considered safe for distribution for interoperable use on an ECDIS. This may require member states to agree on what is considered safe practise for distributing multiple products in an area for interoperable use.

It is further proposed that these Cross-Product Validation Tests are produced jointly between the S-98/S-164 & the S-100 Validation sub groups in liaison with the respective Product Specification groups. The scope of these tests will only cover datasets that are to be used in an interoperable manner.

If there are additional datasets that are intended for use on an ECDIS but are not intended to be for interoperable use, then a mechanism is needed to identify them e.g. S-102 and S-104 products that are to be viewed on an ECDIS but not considered appropriate to use for WLA.

Conclusions
S-100 Validation covers a range of new, complex scenarios, that have not been previously covered by the IHO Validation Checks (S-58). We need to identify and clarify these scenarios and ensure we have agreement on what is considered safe for navigational use on an ECDIS. This will require cooperation across the working groups, project teams and member states.

Recommendations
S-100 is predicated on the use of multiple different product specifications and data types on ECDIS. This requires a more consistent and broad definition of what validation actually "is" and which can be applied to multiple product specifications, and to the S-100 components themselves.

Justification and Impacts
S-100 is a complex framework and the operation of the S-100 ECDIS (including Dual Fuel mode) adds a significant risk of unexpected behaviour when operating outside expected parameters. A broad definition of validation, the different types and categories will minimise the risk of unintended consequences when S-100 ECDIS has been developed.

Action Required of S-100 WG
The S-100 WG is invited to:

a. Note the content of the paper.
b. Endorse the different types of validation required for S-100.
c. Invite the S-100 Validation subgroup to liaise with the S-98/S-164 subgroup and DQWG to clarify the definitions and scope of the different validation tests.
d. Endorse the drafting of an appendix to S-98 to contain Cross-Product Validation Tests
e. Task the S-98/S-164 & S-100 Validation Sub Groups to complete initial content of these tests by working with the relevant Product Specification project teams.