

Paper for Consideration

Progressing the Dual-Fuel ECDIS Concept

Submitted by:	IIC Technologies
Executive Summary:	S-100 and ECDIS-DF
Related Documents:	S-100WG5 ECDIS-DF, HSSC DF
Related Projects:	IMO PS revision, IEC61174 revision, S-100 Edition 5.0.0

Introduction / Background

The strategic plan for rollout of S-100 and its component product specifications is a wide-ranging and comprehensive goal of the IHO. S-100 is now reaching the point where the mechanics of its inclusion in ECDIS can be properly defined and standards for their operation in respect of all IHO product specifications made.

S-100WG5 included a session on Dual Fuel (DF) ECDIS, expanding on a summary paper already written. This session concluded some essential high level principles of DF operations and recommended further detailed work to be carried out to properly, and completely specify the entirety of the IMO operation of ECDIS. At a high level, ECDIS as a means to satisfy SOLAS Ch5 is still foremost but also to be considered should be the various Maritime Services which rest fundamentally on the S-100 framework and its implementation in the component product specifications.

An S-100 ECDIS is also the foundation for enabling the IMO e-navigation concept. and that the S-100 products developed under the IHO domain are an essential component of the defined maritime services (MS)

-) MS5 (MSI S-124)
-) MS11 (ENC, Bathy S-101, S-102)
-) MS12 (Nautical Publications S-122, S-123, S-127, S-131)
-) MS15 (Oceanography S-104, S-111, S-126)

In addition to these services, better UKC determination and management, improved cyber-security and the intelligent interoperability of these component data products under S-98's mechanisms defines the compelling use case for S-100 ECDIS development.

S-57 and ECDIS is a huge achievement by a global community which has taken many of us a large proportion of our working lives to get to. S-100 replaces the standard underpinning the implementation of electronic navigation and therefore shifts the entire foundations of it. S-57 effectively implemented the framework set out by the IMO Performance standard and reflects the production, distribution and use of a single "product", the Chart and its use for vessel navigation.

From the perspective of the S-100WG the migration to standards supporting use of S-100 products in a navigational context (both for SOLAS and eNavigation) requires a central, detailed description of the operation of S-100 ECDIS and its relationship with the component IHO standards which define that operation. IHO HSSC working groups are the correct resource to establish such definitions because although IMO is the defining organisation much of the detail is delegated to individual IHO standards (this is evident from the S-57/S-52 regime where much of the detail of display and behaviour "implementation" is done at IHO standards level).

Analysis/Discussion

S-100 changes, fundamentally, many of the methodologies which underpin current ECDIS operation, freeing much of the functionality from hardwired standards. It defines a number of essential changes across the data chain such as

1. Multiple product specifications packaging discrete collections of features and supporting information / metadata
2. Generic "catalogues" (with associated installation and update functions) which define
 - a. Content

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- b. Portrayal
- c. Interoperability between products on end user systems
- d. ECDIS behaviour such as Alarms and indications, context parameters, pick reports etc...
- 3. A more general type approval testing regime which tests "arbitrary" product specifications and co-display of S-57/S-101
- 4. A similar data protection scheme (to be operated in parallel with the existing S-57 scheme)

The recognition now is that the IMO concept of "navigation" expressed in the current performance standard needs some revision to encompass fully the idea of multi-thematic data content and its interactions. The current IMO performance standard for ECDIS is written largely to replace chart content and its behavior and use. S-100 places all data relevant to vessel navigation within a single framework and with it, its use for appraisal, planning and voyage monitoring.

There is a need, therefore, to reflect this conceptual step forward in the IMO PS and to take advantage of all the advances in technology globally for the benefit of the end user. There is clearly a the need to communicate :

-) The overall operation of an S-100 ECDIS and the various standards and structures which make up the ecosystem in which it exists.
-) The concept and operation of the Dual Fuel ECDIS which enables the full transition.

The aim of a "governance document" is not to specify the technical detail. With the publication of S-98, S-100 viewers, production systems and initial test data, much (all) of the information required is now within the various IHO S-100 documentation but no single high level summary of the S-100 ECDIS concept, nor the transition via Dual Fuel ECDIS currently exists.

At a high level a governance structure/document would :

- 1. Recognise and define each of the stakeholders and end users of the S-100 ECDIS
- 2. Capture all the relevant details at a high level and describe the "changes" required across the entire ecosystem.
- 3. Describe the S100 ECDIS and the Dual Fuel "concept", defining how it builds the picture for the end user from multiple data layers and products. This should also relate how these component parts interact together in the defined stages of navigational processes according to IMO definitions.
- 4. Detail the IHO's transitional period. Examples would be how data producers cope with co-production of S-57/S-101, how to assess the benefits, costs and risks of production of multiple data products (e.g. S-102) in addition to S-101, how type approval testing is implemented
- 5. Fill in the detail between the conceptual IMO processes, the defining standards, the producing entities and the supporting stakeholders; so from each users' perspective, how do they contribute to the operation of the system by the user. Summarise the detail included in existing IHO standards.
- 6. Define how primary supporting bodies (RENCs, RHCs) can support distribution and any likely changes.
- 7. Define summary information suitable for communication with IHO member state stakeholders and the community defining S-100 ECDIS focused on the IMO Performance Standard.

A proposed structure for a governance document shown below. These are suggested topics and a draft order for a document. A

- 1. Introduction and Background
 - a. History of ECDIS and ENC development
 - b. ECDIS stakeholders and their relationships.
 - c. Top level definition of the S-100 ECDIS
 - d. How S-100 differs from S-57 throughout the data path.
- 2. Summary
 - a. What is S-100 ECDIS
 - b. The Dual Fuel ECDIS concept
- 3. IHO Transition period – S-57 to S-100
 - a. Data Producers
 - b. The transition concept
 - c. Supporting transition through co-production

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- d. "Coverage" and "Scheming"
- 4. Standards (IHO, IMO)
 - a. IMO/IEC and IHO standards framework
 - b. How the S-100 framework functions to support navigation (+changes)
- 5. The IMO concept of the S-100 ECDIS
 - a. IMO concepts (minimum test requirements)
 - b. Display
 - c. Alarms and Indications
 - d. Other operations
- 6. What is "ENC" and "SENC" - Data suitable for primary navigation
 - a. Extra Layers, what obscures and what doesn't (e.g Water Levels)
 - b. Arbitrary Data Content
 - c. Interoperability
- 7. ECDIS Operations
 - a. Ingest / Loading
 - b. Portrayal, data loading
 - c. Co-Display and behaviour of S-57/S-101
- 8. Support for ECDIS Operations
 - a. Type approval testing
 - b. Distribution – IHO data protection scheme
 - c. Loading, Ingest, management
 - d. "Data Loading" - portrayal
 - e. Display and co-Display
 - f. Interoperability Operations.
- 9. Data Production Support
 - a. "ENC is the bare minimum" – considerations with multiple product specifications
 - b. "Other products" and their benefits
 - c. "What should I produce?"
- 10. Transition to S-101/S-57 Co-production
 - a. Adoption: initial conversion vs ongoing production
 - b. Co-production guidance, coverage, scheming, consistency, validation
 - c. The path to "S-100 only"

Conclusions

The contents defined in the previous section define an appropriate level of detail which describes the operation of the ECDIS-DF and the elements which support it.

Recommendations

Production of a draft of such a guide should be a priority for S-100WG/HSSC and the IHO community to ensure all stakeholders are considered, that the concepts are sound and workable, and that there are no conceptual gaps which could give rise to safety issues.

Action Required of S-100TSM

The S-100TSM is invited to:

- a. endorse the way forward proposed in this paper
- b. note the value of a conceptual guide to S-100 ECDIS, the governance document and the continued participation of the S-100WG stakeholders in its creation.