Paper Considered by S-100WG TSM3

Interoperability of S-100 Product Specifications.

Submitted by:	S-100 WG Chair
Executive Summary:	Currently there are a number of S-100 based Product Specifications under development which are expected to be used in the next generation of ECDIS as well as in other GIS-based integrated systems. This paper proposes an initial scoping of requirements so a draft S100 Interoperability specification can be written in 2016 to ensure that S-100 products specification intended for use within the same systems are able to interoperate correctly and safely.
Related Documents:	HSSC6-07.1A, S-100 Master Plan, S-100 This paper was adapted from TSMAD29/DIPWG7 11.13A
Related Projects:	S-100WG, ENCWG, NIPWG, TWCWG, DPSWG and IEHG[1]

Introduction / Background

1. The International Maritime Organization (IMO) has defined e-navigation as the "*harmonized collection, integration, exchange and presentation of maritime information on-board and ashore by electronic means to enhance berth to berth navigation and related services, for safety and security at sea and protection of the marine environment."* Furthermore the IMO has decided that e-navigation should encompass a data model on all aspects related to the shipping and the maritime domain, and the so-called "Common Maritime Data Structure" should be built on the IHO S-100 data model. The e-navigation Strategy Implementation Plan is based on five prioritized e-navigation solutions among which solution S-4: integration and presentation of available information in graphical displays received via communication equipment. S4 addresses both ship and shore-based users. The implementation of this solution requires an investigation of the harmonized integration and portrayal of the various information layers.

Analysis/Discussion

2. Currently several Product Specifications (PS) that are intended to be used in the next generation of ECDIS as well as in other GIS-based integrated systems are being developed by IHO Working Groups and stakeholder organizations. Each of these groups comprise experts within their particular domains, but no single group has a "*birds eye view*" of all of the data products that will have to interoperate within a single system.

3. Task D of the S-100WG work plan 2015-2016 provides for the S-100WG to "[Supervise/Advise] and support the development and maintenance of S-100-based product specifications."

4. At the final TSMAD meeting in February 2015 it was decided that a high priority must be given to the development of an S-100 interoperability specification. The main issues that should be taken into consideration include:

- Data clashes resulting from the inclusion (modelling) of the same real world features in multiple PS application schemas;
- Harmonization of portrayal between different data products, e.g. to ensure that less significant features in one data product, are not displayed more prominently than more significant features in another product;
- Data encryption, authentication, and the data supply chain (e.g. the management of PS updates, provision new datasets and the management of feature and portrayal catalogue updates);
- Testing procedures, to ensure that data products are, not only tested against their own performance criteria, but also tested against their intended interaction with other data products;
- How S-102 data will replace S-101 skin of the earth features
- Determining what colours should be set aside for S-101 and not used in other specifications
- Determine the hierarchy of data between different S-100 based specifications that are in the development pipeline
- Recommend which specifications should be reserved for front of bridge use versus back of bridge planning
- How do pick reports work between different products. Would the pick report display both information from the overlay (such as weather) and the S-101 ENC or just the weather information.

[1] Inland ENC Harmonization Group (IEHG)

- How do two different gridded specifications interact with each other e.g. Weather and Bathy
- When the operator turns on some overlays (e.g. weather) then it would turn off much of the display of the underlying ENC so as not to obscure the weather information.
- This specification should also give consideration to the potential need for persistent universal identifiers and how that might work within S-100.
- consider the development of a machine readable catalogue that will tell the system how each product should behave with each other and develop a prototype UML model. For example, this catalogue may define the drawing priorities for each type of product specification.

5. At the S100 Test Strategy Meeting 3 in September 2015 the interoperability guidebook was discussed. In addition to the above issues that need to considered the group also noted that the specification should consider the following use cases for data:

- Data that just sits on top of each other
- Interleaving of Data – data from two specifications need to work with each other.
- Replacement of Data – data which is certified to replace parts of the underlying ENC dataset
- Suppression – data that is designed to suppress the underlying ENC dataset

6. Because S-100 based product specifications are being considered by other working groups, the author of this draft specification should also take into consideration the following papers submitted to IHO working groups:

http://www.iho.int/mtg_docs/com_wg/HSSC/HSSC7/HSSC7-05.5B%20project%20team%20focusing%20on%20Portrayal%20of%20MPA.pdf

Deliverable

7. This specification should follow the S-100 Product Specification Template as far as possible and contain the foundations of an S-100 ECDIS Interoperability specification that assumes that the S-101 ENC is the base layer for navigation and that various other specifications will either interact, replace, suppress or overlay on top of the ENC .

8. In order to constrain the scope of this work only the following product specifications should be used to develop the interoperability model

No / *N°*	Title / *Titre*
S-101	Electronic Navigational Chart (ENC) / *Cartes électroniques de navigation*
S-102	Bathymetric Surface / *Surface bathymétrique*
S-111	Surface currents / *Courants de surface*
S-112	Meteorological and Hydrographic Data AIS Application-Specific Message Dynamic Water Level Data Product Specification
S-122	Marine Protected Areas / *Aires marines protégées*
S-124	Navigational warnings / *Avertissements de navigation*
S-411	Sea Ice (WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology [JCOMM]) *Glace de mer (Commission technique mixte OMM-COI pour l'océanographie et la météorologie marine [JCOMM])*
S-412	Met-ocean forecasts (JCOMM) *Prévisions météo-océanographiques (JCOMM)*

NOTE: S-111, S-411 and S-412 will have similar operations where parts of the underlying ENC data maybe suppressed while the product is on the screen.

Conclusions

9. The implementation of the IMO e-navigation strategy requires the development of data products based on S-100 that will have to interoperate within integrated shipborne and shore based systems. Most of the underlying PS's (which are now fairly mature) have been developed by domain experts and there is a need to determine how they will interoperate within a single system.

10. As a result of a joint project between the Republic of Korea and NOAA a funding has been secured to contract out the initial drafting of this specification based on the above requirements. It is expected that a draft will be available for the September S-100 Test Strategy meeting for the working group to review and provide comments.

Action Required of S-100WG01:

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The S-100WG01 is invited to:

a) Consider this paper;

b) Take any other actions considered necessary.

ANNEX A: List of named S-100 based product specifications that are in various stages of development.

No / *N°*	Title / *Titre*	Status / *Etat*	**Edition** (English version) *(version anglaise)*
Product Specifications being developed by the **IHO** (Numbers S-101 to 199) *Spécifications de produits élaborées par l'OHI (Numéros S-101 à 199)*			
S-101	Electronic Navigational Chart (ENC) / *Cartes électroniques de navigation*	Under Development *En cours d'élaboration*	S-101 Information page See also Roadmapdocument
S-102	Bathymetric Surface / *Surface bathymétrique*	Published / *Publiée*	Ed 1.0.0 (April 2012)
S-10x	Tidal product for surface navigation	Under Development *En cours d'élaboration*	
S-103	Sub-surface Navigation / *Navigation sous la surface*	Under Development *En cours d'élaboration*	
S-111	Surface currents / *Courants de surface*	Under Development *En cours d'élaboration*	Working Draft 1.0
S-112	Meteorological and Hydrographic Data AIS Application-Specific Message Dynamic Water Level Data Product Specification	Under Development *En cours d'élaboration*	Working Draft 0.0.0
S-121	Maritime limits and boundaries / *Limites et frontières maritimes*	Under Development *En cours d'élaboration*	
S-122	Marine Protected Areas / *Aires marines protégées*	Under Development *En cours d'élaboration*	
S-123	Radio Services / *Services radio*	Under Development *En cours d'élaboration*	
S-124	Navigational warnings / *Avertissements de navigation*	Under Development *En cours d'élaboration*	
S-125	Navigational services / *Services de navigation*	Planned / *Prévu*	
S-126	Physical Environment / *Environnement physique*	Planned / *Prévu*	

S-127	Traffic Management / *Gestion du trafic*	Planned / *Prévu*	

Product Specifications being developed by the **International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)** (Numbers S-201 to 299) *Spécifications de produits élaborées par l'**Association internationale de signalisation maritime (AISM)** (Numéros S-201 à 299)*			
S-201	Aid to Navigation Information / *Information sur les aides à la navigation*	Under development *En cours d'élaboration*	
S-20x	Inter-VTS Exchange Format / *Format d'échange inter-STM*	Planned / *Prévu*	
S-20x	Application Specific Messages / *Messages d'applications spécifiques*	Planned / *Prévu*	
S-20x	Maritime Safety Information / *Renseignements sur la sécurité maritime*	Planned / *Prévu*	

Product Specifications being developed by **other Organizations** (Numbers from S-401) *Spécifications de produits élaborées par d'autres **organisations** (Numéros à partir de S-401)*			
S-401	Inland ENC (Inland ENC Harmonization Group [IEHG]) *ENC intérieures (Groupe d'harmonisation des ENC intérieures [IEHG])*	Under Development *En cours d'élaboration*	
S-411	Sea Ice (WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology [JCOMM]) *Glace de mer (Commission technique mixte OMM-COI pour l'océanographie et la météorologie marine [JCOMM])*	Under Development *En cours d'élaboration*	Draft Ed 1.1.0, (June2014)
S-412	Met-ocean forecasts (JCOMM) *Prévisions météo-océanographiques (JCOMM)*	Under Development *En cours d'élaboration*	