Paper for Consideration by S-100WG4

Report on S-100 GI Registry Improvement

Submitted by:	Republic of Korea (KHOA)
Executive Summary:	This paper reports on the improvements to the IHO 3rd S-100 GI Registry since the last S-100WG meeting and discusses its transition plan.
Related Documents:	S-100, S-99
Related Projects:	KHOA S-100 Test Bed Project

Introduction / Background

KHOA reported the development status of the 3rd S-100 GI Registry (beta version) at the last S-100WG3 meeting and TSM6. This paper reports on major improvements since then and discusses the transition to the IHO 3rd Generation Registry (version 3.1).

Analysis/Discussion

History of S-100 GI Registry

The 1st S-100 Registry was developed by the IHO in the past and operated until 2014. KHOA developed the 2nd S-100 GI Registry including some of new information required by S-100 Product Specification 3.0.0. The 2nd Registry consists of Feature Data Dictionary Register and Portrayal Register. In Portrayal register, only four types such as symbol, line, areafill and font were supported and managed. The 2nd Registry was transferred to the IHO and operated as official Registry of the IHO in the first half of 2017.

Since then, KHOA has been designing and developing the new 3rd S-100 GI Registry since 2018 to build additional registers such as Concept Register and Test Bed in accordance with the S-100WG decision.

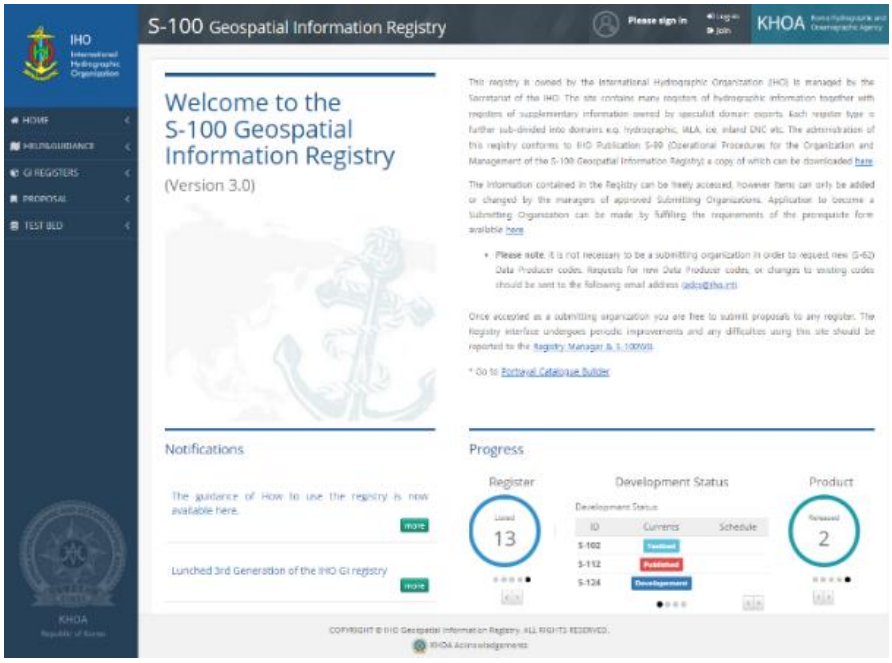

Figure 1. New version of S-100 GI Registry

The new development of the metadata register was decided in accordance with the discussions from S-100WG3 and TSM6 in 2018. At present, there are seven registers including Concept Register and Data Dictionary Register to support S-100 Product Specification 4.0.0 and S-10X development.

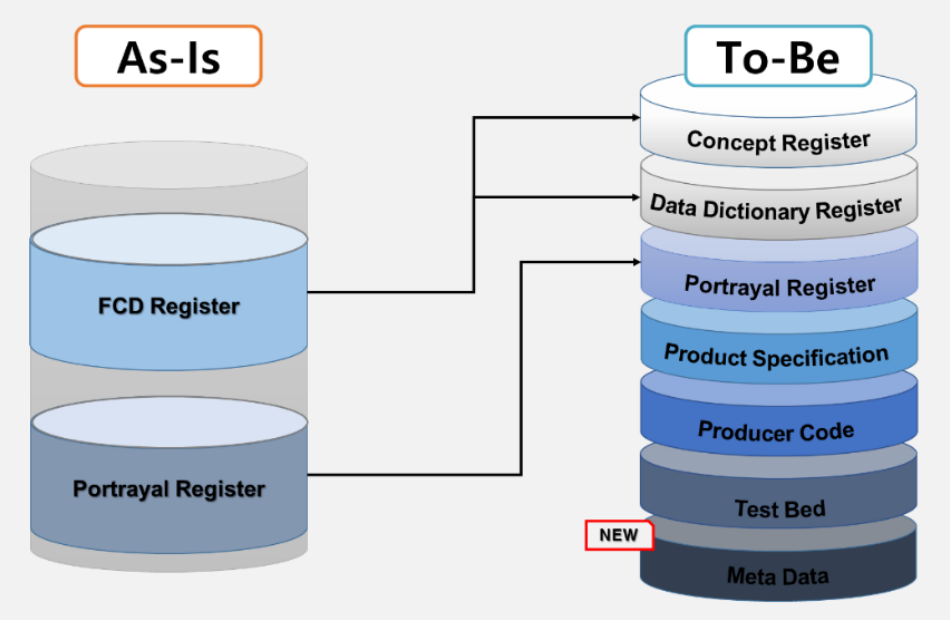

Figure 2. Overview of new database model

S-100 GI Registry Improvements

Compared to the current running version 2.0 registry, the newly developed version 3.1 registry has the following improvements and changes.

Registers	Registry 2.0	Registry 3.0	Remarks
Concept register	N/A	New developed	FCD register was divided into DD register and concept register
Data Dictionary register	Feature Concept Dictionary register	Divided to Data Dictionary register and concept register	
Portrayal register	Only four types support	Whole 19 types supports	
Product Specification	N/A	New developed	Operated with S-10X TestBed page
Producer code	Developed	Operated	Not changed
Meta data	N/A	New developed	

All S-10X Product Specifications based on the S-100 standard use various types of features. In the standard, the concept of the feature is defined first, and it is reviewed by various domain experts. However, the existing 2nd Registry was registered and managed immediately without a corresponding procedure. As a result, duplicate features may be registered for each domain due to the lack of review by various domain experts.

In the 3rd registry, S-10X developers should register the features as concept type first to get review by all domains and transfer the concept as a feature. Also the Portrayal register which was previously only available for Symbol, Line, and Areafill has been improved to support all 18 portrayal types required by S-100 standard and various S-10X Product Specifications.

S-100 aims to manage and distribute information on each S-10X data through metadata. The metadata registration part was developed based on the metadata design result which was approved at the last TSM6. .
As S-100 was approved as edition 4.0.0, various S-10X specifications are being developed based on this, and the S-100 Registry has developed a testbed web page to activate product specifications and stabilize the standard. The testbed page was developed to integrate and manage S-100-based product standard documents, catalogue, test data sets, and scenarios under development and to use them in the IHO S-100 Test Bed Program. In addition, it can be used in many ways such as confirming the conformity to developed standards by storing related records, and it is intended to borrow the following operational procedures. S-10X Product Specifications developed through the testbed page are complemented by various stakeholder review and verification procedures, and the

completed Product Specification is transferred from the test bed page to the Product Specification register for general users.

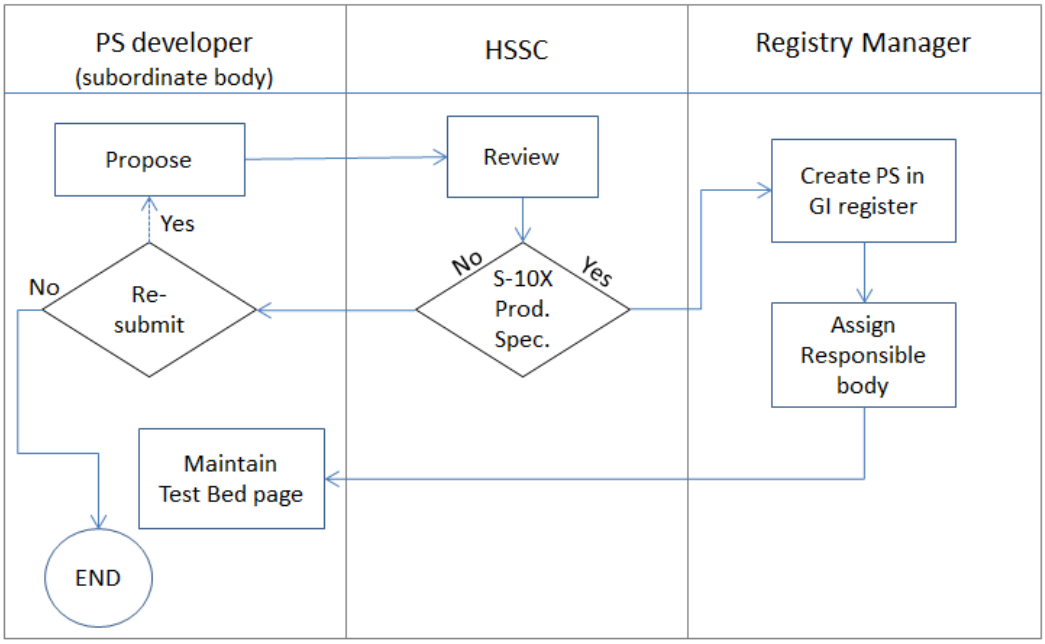

Figure 3. Management flow of Test Bed Webpage

S-100WG, NIPWG and other WGs are using S-10X FC with the Registry and FCB (NIPWG 6-32.2 Unit of measure, quantity specification and constraints are not captured in the registry for various attributes). This information is used for several attributes in S-127, and the corresponding FCB therefore imposes unwanted omissions on S-127.1) It is necessary to review whether the UNIT is limited to registration and management in the Registry, FCB to each Feature, and 2) Registry to Binding. The KHOA's recommendation is to register the UNITs as the Codelist of the Registry and binding function should be processed by FCB.

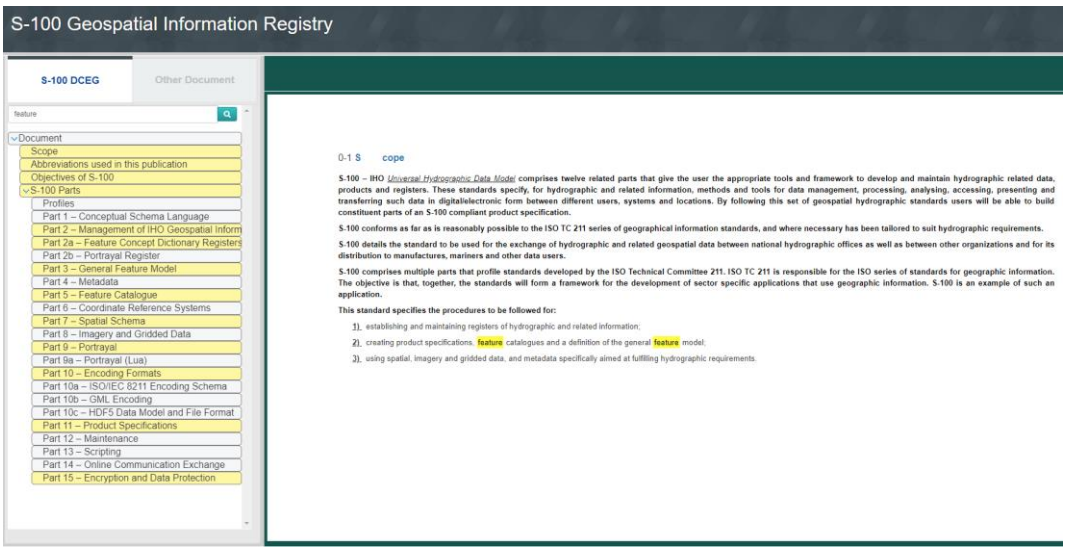

Figure 4. Overview of DCEG verification system

In addition, Document register was developed to notify the revised part for S-10X stakeholders as human readable document in an easy way. This allows stakeholders in the maritime domain to easily check for revisions through DCEG if there are any changes to S-10X Product Specifications.

Proposal process

The 3rd S-100 GI Registry has been developed with three processes as improved system and new registers.

a) Full process

This is the same process as the existing FDD registration of 2nd registry, and is a process in which both the proposer and RM and DCB are reviewed. There are four types of concept register and drawing register (symbol, line, area, font).

b) Semi process
Since the basic review has been completed through the full process by the concept registration, the DD register utilizing the concept uses a simpler semi-process. Only the proposer's proposal and DCB review are applied here.

c) Simplified process (A, B type)
This process is for general parts such as few suggestions by user or stakeholder. It corresponds to the process that the administrator manages. A type is approved by the RM when proposed by the proposer, and among the metadata register and portrayal register (10 types except schema and four types).
In case of B type, the RM directly registers and modifies when there is a request of the domain, and five types of schema-based portrayal items are applicable.

Document register
The S-100 user can check the standard document of S-10X Specifications in the form of DOC through the document register. In addition, the FC produced through the S-100 FCB is stored in the DB of the Registry, and the FC loaded from the document register can be displayed in the form of a DCEG document. If the FC is revised, the latest version and the previous version of the FC are loaded and displayed as the DCEG document form, and then the different parts are highlighted in the text to easily confirm the revised details.

Test Bed
The Test Bed system was developed for the activation and stabilization of S-10X Product Specifications which is being developed based on S-100. PS developer shall upload and manage the developed results (FC, PC, PS document, verification scenario, etc.) to Test Bed. It is also possible to approve step by step through reviews of related domain stakeholders. After final development, product specification is transferred to product specification register automatically, and general users can freely use corresponding product specification afterwards.

Transition plan
The present 3rd Registry was developed with seven registers and has been tested by the KHOA Research Team. In February, KHOA will demonstrate the 3rd Registry in the S-100 Registry Workshop in conjunction with the S-100WG4 and introduce the changed concepts and contents. The new registry will be transferred as official IHO registry in May.

Conclusions
To share and notify S-10X FC and PC, TDS, test results, and other development documents, a new system was required to support the S-100 Test Bed program. S-100 Test Bed system webpage was developed in the new S-100 GI registry and has been tested by the KHOA Research Team.

KHOA is planning to improve the quality of S-100 Registry and test bed program by receiving expert review of S-100 / 10X field through S-100 Registry workshop which is linked with this S-100WG4 meeting. A transition plan will be reported to use as IHO official S-100 GI Registry.

Recommendations
Request to review the followings for transition of S-100 GI Registry as IHO's official Registry.
1) A plan of unit management for feature (Registry VS FCB S/W)
2) A validation and test by S-10X stakeholder of S-100WG before Registry transition

Action Required of S-100WG
The S-100WG4 is invited to:
a. **Note** this paper