Paper for Consideration by TSMAD/DIPWG

A method of improving consistency between the S-101 DCEG and the Feature Catalogue

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Executive Summary:	This paper was written to discuss a method to minimize inconsistency and human errors between DCEG and Feature Catalogue for S-10X product specification.
Related Documents:	S-100, S-101 DCEG, S-101 Feature Catalogue
Related Projects:	IHO S-100/S-101 Test Bed Project

Introduction / Background

KHOA developed a draft version of S-100 Feature Catalogue Builder (FCB) and compiled the S-101 Feature Catalogue according to the DCEG developed by S-101 DCEG group. The current version of S-101 Feature Catalogue is 0.8.8 and contains huge amount of information including 179 numbers of Feature types, 2 numbers of Information types and quite a lot of simple/complex types.

As DCEG and Feature Catalogue were made from different sources, it is natural that there may be a few inconsistencies between the two items. As the current FC creation process is to input and bind data by hand using S-101 FCB after cognitive processes of DCEG, the output could include human errors. This paper was written to discuss a method to minimize inconsistency and human errors between DCEG and Feature Catalogue for S-10X product specification.

Analysis/Discussion

DCEG and Feature Catalogue
S-100 based S-10X product specification includes DCEG (Data Classification Encoding Guide) and Feature Catalogue. S-100 defines DCEG and Feature Catalogue like below;

- **DCEG**: This document is developed to provide consistent, standardized instructions for encoding S-100 compliant data. S-101 DCEG has been laid out, as far as possible, along the lines of the IHO publication S-4, Part B "Chart Specifications of the IHO – Medium and Large-Scale National and International (INT) Charts". The purpose of this document is to facilitate S-101 encoding to meet IHO standards for the proper display of ENC in an ECDIS. The document describes how to encode information that the cartographer considers relevant to an ENC.

- **Feature Catalogue**: A feature catalogue is a document that describes the content of a data product. It uses item types, for example, features and attributes, from one or more feature data dictionaries. The basic level of classification in a feature catalogue is by feature type and information type. A feature catalogue should be available in electronic form for any set of geographic data that contains features. A feature catalogue may also comply with the specifications of this part of S-100 independently of any existing set of geographic data. A feature catalogue is defined for each product specification. Features and attributes are bound in a feature catalogue. The definitions of features and attributes are drawn from a Feature Concept Dictionary.

As a DCEG is an encoding guide for user to develop datasets consistently according to S10X Product Specification, below information is common structure for each feature type.

- Feature Definition
- Feature name and S-57 Acronym
- Primitives (Point, Curve, Surface)
- Image and Symbol (Real World, Paper chart symbol, ECDIS symbol)
- Included Attribute information (Attribute name, S-57 Acronym, Allowable Encoding Value, Attribute type, Multiplicity)
- INT 1 Reference
- Feature Attributes and Enumerate Proposals
- Associations/Aggregations/Compositions

Meanwhile, a feature catalogue is a machine readable standard to describe contents for specific product and consists of below elements;

- Root : name, scope, fieldApplication, versionNumber, versionDate, producer
- S100_FC_DefinitionSources
- S100_FC_SimpleAttributes
- S100_FC_ComplexAttributes
- S100_FC_Roles
- S100_FC_InformationAssociations
- S100_FC_FeatureAssociations
- S100_FC_InformationTypes
- S100_FC_FeatureTypes

Work process to develop S-10X product specification

After analysing the development process of S-101 ENC Product specification and S-100 relevant documents, a brief work process to develop S-10X PS was summarized as below.

- Step 1. Surveying and Analysing User Requirements
- Step 2. Building a Product Specification
  - Define real world features and attributes
  - Determine how the features and attributes will be put together
  - Data Classification and Encoding
  - Create a Product Specification Document
  - Register any new features/attributes/enumerations
  - Create an XML Feature Catalogue
  - Determine if you need new portrayal
  - Create an XML Portrayal Catalogue
- Step 3. Implementation of Test Bed
  - Create Test data
  - Organize a test bed

Above work process to develop S-10X PS is very rough. The detailed order in the work process can be changed. Although the DCEG and Feature Catalogue include common contents, each item is developed in a separate process. The difference of source information between two items can make inconsistency and manual work according to the DCEG can include human errors in a feature catalogue.

Example of inconsistency and human errors between S-101 DCEG and Feature Catalogue

Inconsistency and human errors were surveyed between DCEG final baseline and Feature catalogue 0.8.8, which was described in detail in the submitted document (TSMAD29/DIPWG7-10.4A Comparison between the S-101 DCEG and the S-101 XML feature catalogue). While two items share same information, they are made by different results.

DCEG is made from documents, but Feature Catalogue is created by using source data of FCD Register in S-100 Registry, therefore, there are possibilities for inconsistencies between the two items. As S-100 FCB user compiles the feature catalogue after cognitive processes of DCEG, the output could include human errors.

Current work process of DCEG and Feature Catalogue

A DCEG is made for a dataset capture guide in the development process of S-10X product specification and includes all binding and association information for Feature Types and Information Types. As stage to edit DCEG means to draft S-10X product specification, the document can include un-registered types as well as registered types in the S-100 FCD register.

The new feature type and information type used in the work of DCEG can be proposed to S-100 FCD register and approved. If all new types are approved in the S-100 Registry, S-100 FCB (Feature Catalogue Builder) access to S-100 FCD Register and complete to compile the feature catalogue according to the DCEG using loading information. The Fig. 1 describes the mentioned process.
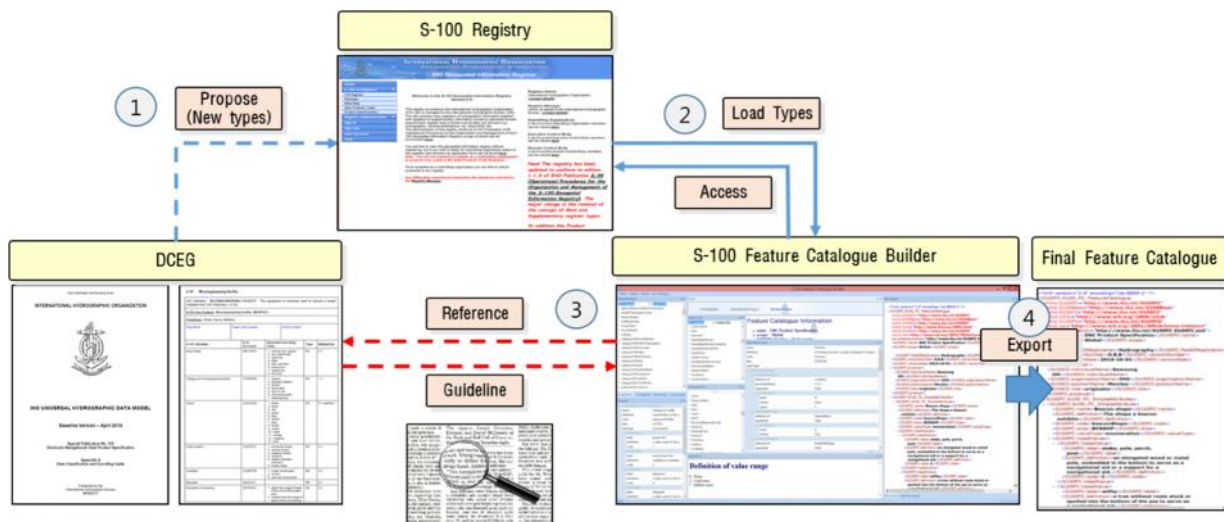

Fig. 1. Current work process of DCEG and Feature Catalogue

A method to improve inconsistency and human errors in the work process of DCEG and Feature Catalogue

A method that Feature catalogue use DCEG contents as a database or exchange datasets, can be a solution which minimize inconsistencies and human errors between DCEG and feature catalogue. But, if feature types and information types are not complex in terms of product's size, simple process can be appropriate. This paper proposes two kinds of procedures and the detailed process is described in the Fig. 2.

1) **SIMPLE PROCEDURE** (In case of small size product, same with current process):
   After the DCEG is made and new types is proposed, feature catalogue is compiled separately for the S-100 FCB to access to S-100 FCD register as it currently is.)

2) **CONNECTION PROCESS** (Big size product like S-101):
   If DCEG Editor is developed, DCEG can be developed using Types information from S-100 FCD Register. The compiled DCEG will be saved into DCEG database.

   If there are changes in S-10X PSs, the S-10X feature catalogue can be updated very easily just to add metadata connecting to DCEG DB rather than connecting to S-100 Registry.
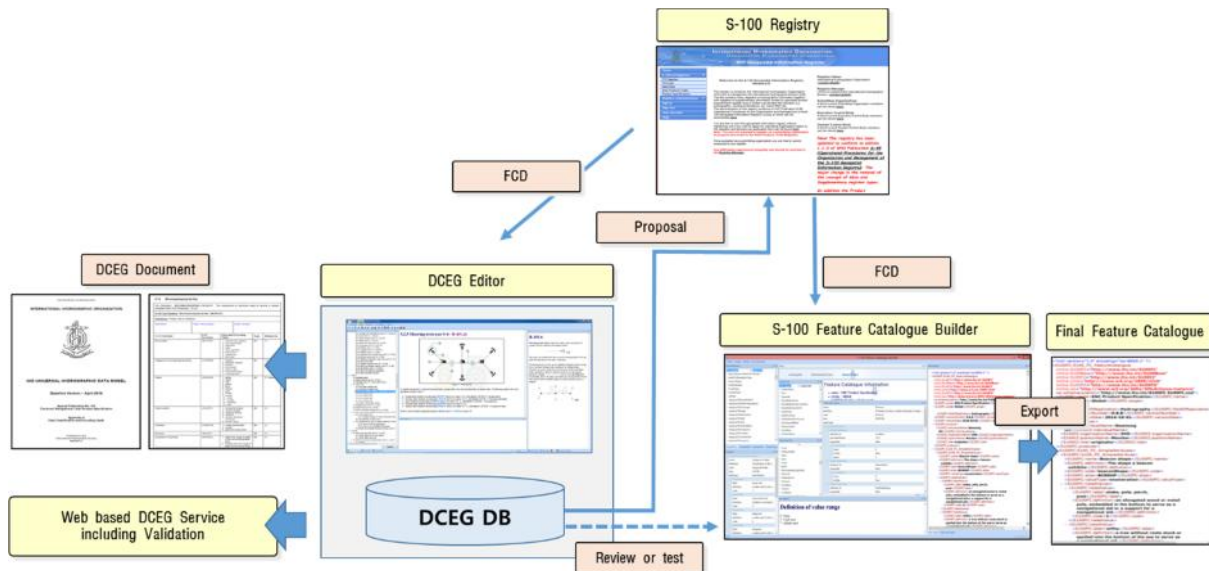
Fig. 2. A method to improve inconsistency and human errors in the work process of DCEG and Feature Catalogue

The biggest advantage of S-100 is to ensure that various versions of S-10X product can be managed and a concept of Plug & Play can be realized. If the product needs to be changed, the feature catalogue and portrayal catalogue can be synchronized through the catalogue database in the S-100 registry. But, DCEG also have to be considered carefully when the product needs to be changed. It's assumed that any changes of data model in a Product include revision process of relevant data all the same time.

- Changes of data model in a product (New feature/information/enumeration types, modify, delete)
- Update of DCEG
- Update of Feature Catalogue
- Update of Portrayal Catalgoue

The proposal presented in this paper need to be discussed to cover requirements on consistent update of DCEG, Feature Catalogue, Portrayal Catalogue for the changes of the product above.

As work environment of hydrographic service is supported by Internet, it's needed to consider that DCEG can be produced as web service, not paper document. To make this concept realize, transition of DCEG contents to database deserves to be discussed. ROK would like to seek expert's opinions on the proposal, which minimize inconsistencies and human errors in the work process of DCEG and Feature Catalogue.

As the proposal presented in this paper is in a conceptual level, it's needed to identify relevant user's requirements and verify the proposed concept in a test bed project. KHOA will report more clarified plans through an additional tangible research if agreed.

Action Required of TSMAD TSM

The TSMAD29/DIPWG7 is invited to:

- a. note the issues presented in this paper
- b. approve ROK to research in detail to ensure the presented concept clear.
- c. request relevant experts to be involved.