5th S-100 TEST STRATEGY MEETING

Virginia, USA – 19-21 September 2017

Paper for Consideration by the S-100 Test Strategy Meeting (TSM)

Proposed Structure of the IHO Geospatial Information (GI) Registry

Submitted by:	IHO Secretariat.
Executive Summary:	Continued practical use of the IHO Geospatial Information (GI) Registry since it became operational in October 2016, and decisions at S-100WG2 to add an overarching Concept Register to the structure have prompted further discussion within the IHO Secretariat.
Related Documents:	1. S-100WG2-9.2 – *Summary of Activities of the IHO GI Registry (rev1)*. 2. S-100WG2-9.3A – *Proposed Extension to the IHO Registry*. 3. S-100WG2-9.5 – *Review of IHO GI Registry Content (rev1)*. *4. S-100WG2 Minutes and Actions*.
Related Projects:	Development of the IHO Geospatial Information Registry.

Introduction / Background

1. The IHO Geospatial Information (GI) Registry became operational in October 2016. From this time a significant amount of work has been done in registering new items in the Feature Concept Dictionary (FCD) Register, as well as performing overall Registry management functions and discussing possible improvements that can be made in the Registry structure based on the experience gained so far.

2. At the S-100WG2 meeting (Genoa, Italy, 15-18 March 2017) a number of papers were submitted to the meeting related to the Registry structure and activities, which resulted in several decisions and actions being taken, including a revision of the Registry structure to include a Concept Register; a review of the content of the Registry; and perform a resultant review of IHO Publication S-99 – *Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry*.

3. In the course of progressing these actions from S-100WG2 and continuing the day-to-day activities of the Registry, there have been further discussions within the IHO Secretariat as to how the Registry structure may be further refined. In order to best summarize the outcomes of these discussions, it was decided to develop a schematic diagram and some supporting explanatory notes to capture these outcomes.

Analysis / Discussion

4. The schematic diagram reflecting the thoughts of the IHO Secretariat and showing the overall refined structure of the IHO GI Registry, incorporating an indication as to the flow of activities from the submission of proposals from Submitting Organizations through to the

implementation of these proposals in a published Product Specification, is included at the end of this Paper. Explanatory and supporting notes for the diagram are also included. In addition to the inclusion of the fundamental Concept Register as agreed at S-100WG2, the following aspects of the refined Registry structure should be noted:

- Within the Feature Data Dictionary Register, each S-100 based Product Specification has its own Domain, which effectively acts as the "sandbox" for Product Specification development.
- In order to ensure consistency of the composition of enumerated and "open enumeration" Codelist type attributes, it is proposed that an "Enumerate Register" be implemented.
- The Feature Catalogue Builder and Portrayal Catalogue Builder are the tools used for extracting concepts from the Concept and Enumerate Registers for data modelling within the Domains; and for creation of draft and finalized Feature and Portrayal Catalogues for inclusion in Product Specifications.
- The proposed relationship between the Registry and the Hydrographic Dictionary (database) was discussed at the HDWG1 meeting (London, UK, 25-26 July 2017). It is acknowledged that such a relationship is required, and discussion as to how this could be implemented is ongoing.

5. Also note that the main focus of the schematic at this stage is the relationship between the Concept Register and the Feature Data Dictionary Register. Further work is required to develop the structure and relationships for the Portrayal Register. It anticipated that this will occur as further experience is gained in the current Registry structure.

Conclusions

6. The IHO GI Registry structure as shown in this Paper reflects the outcomes of discussions within the IHO Secretariat based on experience and observations from the day-to-day administration and management of the Registry. This structure has been refined incrementally as discussions have progressed in order to resolve issues that have risen from Registry use and the ongoing review of the content of the FCD Register.

Recommendations

7. TSM to consider the proposed structure and provide comment and further input, noting that this structure reflects the thoughts of the IHO Secretariat and experience with the administration and management of the Registry.

Justification and Impacts

8. Refinement of the structure of the IHO GI Registry is required in order to optimize the management and administration processes of the Registry; consolidate, and improve management of, Register content; and provide an appropriate environment for S-100 based Product Specification developers to do their work without unnecessary Registry oversight.

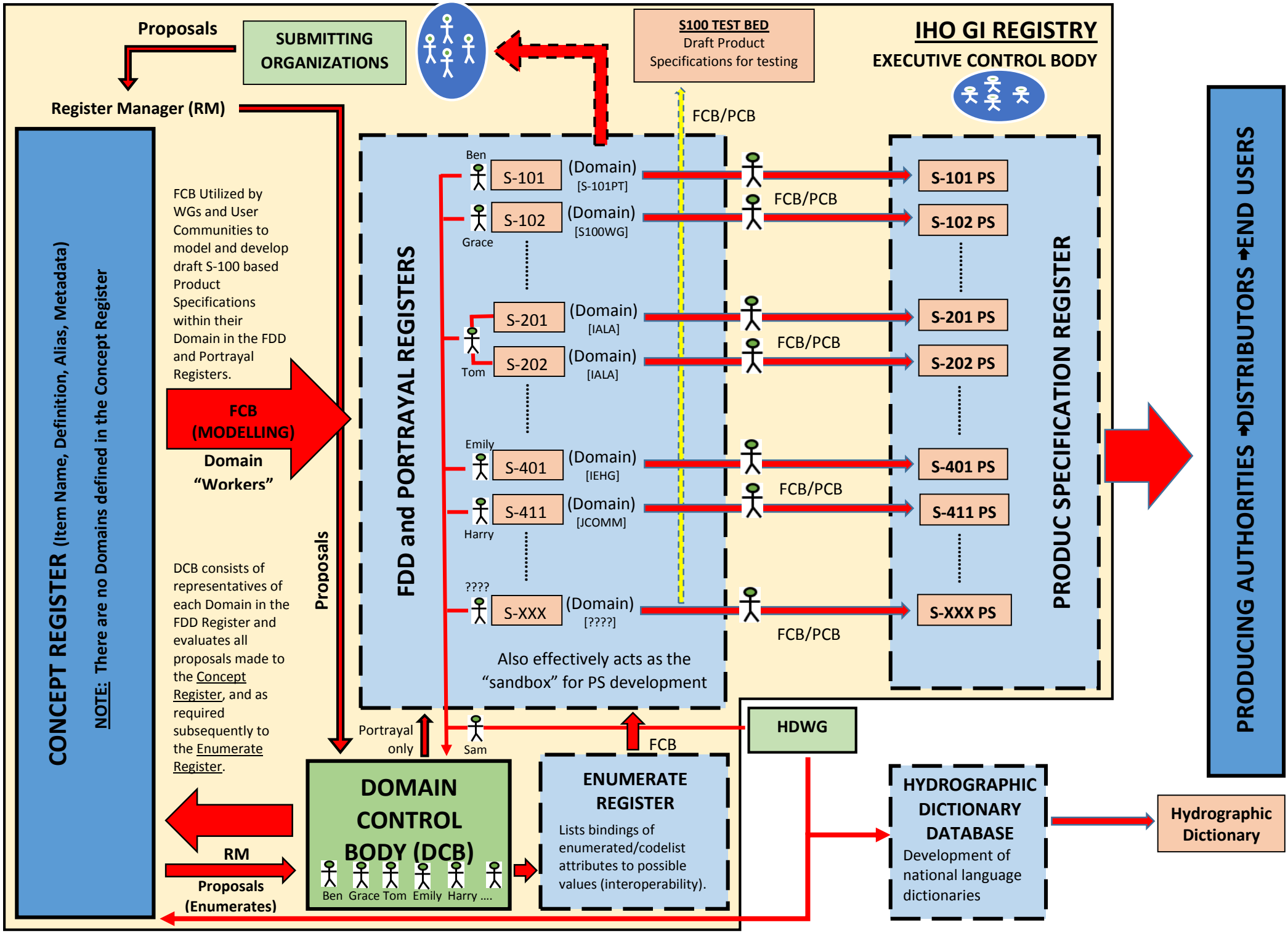
9. Impact will be principally on the Registry development team at KHOA and IHO Secretariat staff.

Action required of TSM

10. The TSM is invited to:

    a. **Note** this paper.

    b. **Provide** ongoing comment and feedback to the IHO Secretariat as refinement of the Registry continues.


Proposals
SUBMITTING ORGANIZATIONS
S100 TEST BED
Draft Product Specifications for testing
IHO GI REGISTRY
EXECUTIVE CONTROL BODY
Register Manager (RM)
FCB/PCB
CONCEPT REGISTER (Item Name, Definition, Alias, Metadata)
NOTE: There are no Domains defined in the Concept Register
FCB Utilized by WGs and User Communities to model and develop draft S-100 based Product Specifications within their Domain in the FDD and Portrayal Registers.
FCB (MODELLING)
Domain "Workers"
Proposals
FDD and PORTRAYAL REGISTERS
Ben
S-101
(Domain)
[S-101PT]
Grace
S-102
(Domain)
[S100WG]
Tom
S-201
(Domain)
[IALA]
S-202
(Domain)
[IALA]
Emily
S-401
(Domain)
[IEHG]
Harry
S-411
(Domain)
[JCOMM]
????
S-XXX
(Domain)
[????]
Also effectively acts as the "sandbox" for PS development
PRODUC SPECIFICATION REGISTER
S-101 PS
S-102 PS
S-201 PS
S-202 PS
S-401 PS
S-411 PS
S-XXX PS
PRODUCING AUTHORITIES →DISTRIBUTORS →END USERS
DCB consists of representatives of each Domain in the FDD Register and evaluates all proposals made to the Concept Register, and as required subsequently to the Enumerate Register.
Portrayal only
Sam
FCB
HDWG
RM
Proposals (Enumerates)
DOMAIN CONTROL BODY (DCB)
Ben Grace Tom Emily Harry ....
ENUMERATE REGISTER
Lists bindings of enumerated/codelist attributes to possible values (interoperability).
HYDROGRAPHIC DICTIONARY DATABASE
Development of national language dictionaries
Hydrographic Dictionary

IHO GEOSPATIAL INFORMATION (GI) REGISTRY STRUCTURE

Explanatory and Supporting Notes

Concept Register:

- The Concept Register is effectively the "source" register from which all hydrographically-relevant concepts are drawn for modelling in S-100 based Product Specifications.
- A single instance only of each concept exists in the Register. Each concept must be unique (that is, no two concepts can be interpreted to describe the same "real world" entity), and is described by Item Name; Definition (with supporting metadata); Unique ID; Alias(s) (if any); Status (Valid, Invalid (or Not Valid), Superseded, Retired); Lineage and Maintenance Metadata; and a flag to identify whether the concept is included in the IHO Hydrographic Dictionary.
- The Concept Register is not partitioned into separate Domains. In other words it is "domainless". However, assessment of proposals to the Concept Register is done by the Concept Register Domain Control Body (DCB), which consists of representatives of each of the Domains contained in the Data Dictionary Register (and HDWG) – see notes on DCB below.
- IHO GI Registry Process:
    - Submitting Organization submits a proposal to the Register via the IHO GI Registry interface;
    - Proposal is assessed by the Register Manager for completeness and possible duplication with items already registered. If suitable, the proposal is forwarded to the Concept Register Domain Control Body. [If considered to be not suitable, the proposal is "rejected" and returned to the Submitting Organization for further rework/resubmission or withdrawal based on Register Manager comments.];
    - Proposal is assessed by the Concept Register Domain Control Body for suitability and possibly impact on Product Specification(s) under the individual members' area of expertise. If approved, the proposal is forwarded to the Register Manager for incorporation in the Register. [If rejected, the proposal is forwarded by the Register Manager back to the Submitting Organization for rework; or appeal by the Submitting Organization to the Executive Control Body.];
    - Register Manager commits the approved change to the Concept Register, and the Submitting Organization is notified of the change, from which time the change is available for use in the Feature Data Dictionary Register and the Enumerate Register.

Feature Data Dictionary (FDD) Register:

- The Data Dictionary Register is partitioned into Domains. Each Domain corresponds to an S-100 based Product Specification. It has been proven that having multiple Product Specifications being derived from a single Domain causes problems within the Domain as the possibility exists that multiple instances of a single concept modelled in different ways may be required in the Domain dependant on the requirement of each Product Specification.
- Concepts are drawn from the Concept Register by nominated representative(s) from the relevant IHO Working Group or User Community, utilizing the Feature Catalogue Builder (FCB), into a Domain within the Register. Within the Domain, the modelling (assign geometry; type; binding; multiplicity) and data encoding rules for the Product Specification are developed.
- There is no overarching IHO GI Registry structure or process governing how the development work within a Domain is managed. This is the responsibility of the Working Group or User Community that is developing the Product Specification. There is no requirement for the Register Manager, Registry Manager, DCB, or ECB to be involved in the actual development of the Product Specification, except for the initial establishment of the Domain; processing new proposals from the Domain to the Concept Register; and providing advice and guidance as required. All responsibility for ensuring a complete and robust process in order to produce a fit-for-purpose Product Specification are the responsibility of the governing IHO Working Group or User Community (noting however the existing approval process for IHO S-100 based Product Specifications).

- The process and participants for development and maintenance of the Product Specification can be organized by the Working Group or User Community responsible as required so as to best achieve the required end result. For example, the IHO S-101 Project Specification is being developed by a dedicated Project Team operating under the S100WG, while S-102 was developed by a very small group of subject matter experts (essentially a "one man band"), and simply reported its progress to the S100WG as required. Similarly, cooperation between Domains may be "sub-managed" by smaller cross-Domain groups in order to harmonize and optimize Product Specification development – for example the IHO Hydro "Cross-Domain Group" between the S-101 Project Team and the NIPWG. Again, it is important to note that this is not a part of the overarching administration or management of the IHO GI Registry.
- At any stage during Product Specification development, a draft product Feature and Portrayal Catalogue may be created (utilizing the Feature Catalogue Builder and Portrayal Catalogue Builder) from the Domain within the FDD Register for testing in the S-100 Test Bed. This effectively means that the Domain space within the Feature Data Dictionary Register acts as the "sandbox" for development of the Product Specification.
- When all requirements for the development, testing and approval of the Product Specification have been satisfied, the final Feature and Portrayal Catalogues are produced, utilizing the Feature Catalogue Builder and Portrayal Catalogue Builder, and included in the published Edition of the Product Specification.
- The published Product Specification is included in the Product Specification Register, which holds all published versions of the Specification. From this point, further development can be done in the FDD Register for the next draft of the Product Specification.
- IHO GI Registry Process:
    - The Working Group/User Community applies to the Registry Manager to have a Domain assigned to them for an S-100 based Product Specification.
    - When approved by the Registry Manager, the Domain is established. The Working Group/User Community then assigns representatives of their group to act as Submitting Organization, Domain Control Body and Domain "Worker" representatives. The Domain "Worker" essentially has write access to the Domain for the application of the data modelling for the Product Specification, and is given access to the Feature Catalogue Builder for interface with the Concept Register so as to create draft Feature Catalogues for testing and final publication.
    - Based on draft modelling included in the draft Product Specification, the Working Group/User Community for which the Domain has been created extracts concepts from the Concept Register, and models the concept according to their requirements (defines geometry, type, binding, cardinality, encoding guidance). This is done by the Domain "Worker" utilizing the Feature Catalogue Builder. The Registry interface provides a query mechanism whereby users of the Registry can enquire as to how a concept from the Concept Register has been modelled in all instances of its use in the FDD Register and within Enumerate Register – this will assist in Product Specification development and contribute to interoperability;
    - Proposals for new or revised concepts required to the Concept Register are proposed by the Submitting Organization representative for the Domain as required;
    - As required, a draft Feature Catalogue can be extracted from the Domain, utilizing the Feature Catalogue Builder, for testing in the S-100 Test Bed.

Enumerate Register:

- The intention of the Enumerate Register is to provide the mechanism for ensuring consistency and interoperability between data created conformant to S-100 based Product Specifications. The Register contains instances where a concept from the Concept Register has been modelled in an S-100 based Product Specification as an enumerated attribute or an "open enumeration" Codelist type; and the full list of allowable enumerate codes and their values (also as taken from the Concept Register) for the attribute. The rationale behind the establishment of an Enumerate Register is that, if such a Register does not exist, Product Specification developers could create their own enumerate lists for the same enumerate type attribute, having different values assigned to enumerate codes. This would cause considerable problems with interoperability.

- As for the Concept Register, the Enumerate Register is "domainless". There must only be a single instance of a concept from the Concept Register included in the Enumerate Register, with all possible values (codes) as used in any S-100 based Product Specification listed against that attribute.
- All enumerated attributes and their enumerate values are derived from the Concept Register.
- Data modellers working within their Domain within the Feature Data Dictionary Register access the Enumerate Register using the Registry interface. They can select attributes from the Register and bind them to the appropriate features/information/complex attributes within their data model, selecting only those required values (codes) from the allowable full list to satisfy the requirements for their Product Specification.
- As required, Submitting Organization representatives for a Domain can submit a proposal to the Register (and the Concept Register as required) to add new attributes; or new enumerated values to existing attributes within the Register. The management of content and administration of the Register is as for the Concept Register.
- IHO GI Registry Process:
    - Data modellers working within their Domain, when requiring a registered item in the Concept Register to be an enumerate type attribute within their data model, query the Enumerate Register for the existence of the attribute. If the attribute does not exist, they submit a proposal to the Register in the same manner as would be done for the Concept Register. Proposals are assessed by the Register Manager and Domain Control Body and actioned accordingly. The same process is followed if there is a requirement to add a new value (code) to the enumerate list for the attribute.
    - Utilizing the Feature Catalogue Builder, the attribute is imported from the Enumerate Register to the Domain within the Feature Data Dictionary Register, along with those values (codes) for the attribute required for the Product Specification (which may or may not be the entire list of allowable values).

Product Specification Register:

- The Product Specification Register holds the published versions of all S-100 based Product Specifications.
- IHO GI Registry Process:
    - When all requirements (testing, approvals, …) for the development of the Product Specification have been met, and the final components of the specification have been produced (Product Specification document (including Data Classification and Encoding Guide); Feature Catalogue; Portrayal Catalogue), the new published version of the Product Specification is added to the Product Specification Register;
    - The previous version of the Product Specification should normally be given the status of "Retired" (note however the occasional exception as with S-52 PL, S-64 and S-58).

Submitting Organization:

- Proposals from Submitting Organizations are submitted only to the Concept Register. There is no requirement to describe how a new concept proposed to the Concept Register will be modelled in an S-100 based Product Specification – this is at the discretion of the Working Group/User Community developing their model in the Data Dictionary Register, once the concept has been registered in the Concept Register.
- In general, there should be at least one member of each of the Domains in the Data Dictionary Register nominated to be a Submitting Organization representative for the relevant Working Group or User Community. However, where two or more Domains are under the management of a single User Community, a single Submitting Organization representative may be identified to cover all relevant Domains (refer to IALA S-201 and S-201 Domains in the diagram); this is at the discretion of the Working Group/User Community.

Concept Register Domain Control Body (DCB):

- The Concept Register Domain Control Body is comprised of a member of each of the Domains in the Feature Data Dictionary Register.
- A member of the Domain Control Body is effectively the representative of the IHO Working Group or User Community utilizing the IHO GI Registry to develop and maintain S-100 based Product Specifications. The method by which each Domain Control Body member disseminates/discusses proposals within their expert

group(s) (if at all) is at the discretion of the individual IHO Working Group or User Community for which the Domain has been created, and is therefore independent of the overall IHO GI Registry management process.