



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Item Name; Definition (with supporting metadata); Unique ID; Alias(s) (if any); Status (Valid, Invalid (or Not Valid), Superseded, Retired); Lineage and Maintenance Metadata; and a flag to identify whether the concept is included in the IHO Hydrographic Dictionary.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”. This necessitates that the concepts registered will be essentially generic in regard to their application in hydrography [specializations will be defined within the Domains in the Data Dictionary Register]. 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, DQWG) – 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 possible 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/or the Enumerate Register.

Feature Data Dictionary (FDD) Register:

- The Data Dictionary Register is partitioned into Domains. Each Domain will generally correspond to a single 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. Multiple Product Specifications within a single Domain should be considered only where these Product Specifications share all (or most) of a single Application Schema; or the Application Schema for a Product Specification is essentially a “subset” of the Application Schema for another 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, Feature Catalogue development (assign geometry; type; binding; multiplicity) based on the Application Schema for the Product Specification is done.
- 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

Commented [TS1]: RM : I am arriving at the realization that the concept register idea should be more flexible than this document and the diagram suggest. Either the CR should allow for “senses” or “scopes” like a **lexical database or thesaurus**, or the architecture and guidance documents should explicitly allow for product specifications and the data dictionaries to make different types of derivations from the concept register (especially refinements, and specializations or partitions). Use the concept register to link the derivations, and require derivations to describe the relationship to the entry in the concept register, e.g., which item (and which sense) it relates to and the nature of the derivation (refinement, specialization).

JW: Not sure what this means – need some worked examples.

RM: Will try to put together a few slides for the S100WG meeting.

Commented [TS2]: RM : The tendency will be to reject anything that might have an impact, which would block development of new products or introduction of new maritime information domains. Adding **senses or scopes** would mitigate, though not avoid, this potential problem. **JW:** Need to know more about “senses or scopes” – how is this implemented?

RM: The simplest implementation might be just to add a « senseNumber » to the item record for a term, so we can have different senses for the same term.

Commented [TS3]: RM : This is likely to be very troublesome for implementers. It will also be troublesome for product specifications that share parts of their application schemas.

JW: Have amended the wording, however need to know more about “scopes” sand “namespaces”.

RM: In its simplest form, a scope is a « container » for terms (or other scopes); a namespace is more or less the same idea as « scope » but carries the connotation of uniquely identifying an item by prefixing its local identifier (in its immediate scope) with one or more names identifying the scope hierarchy in which it is defined. For example, URNs.

Commented [TS4]: RM : Introduce **scopes or namespaces?** Need to develop a middle ground between total independence and total integration of different product specifications.

Commented [TS5]: RM : The application schema (UML model) is developed first, then the feature catalogue. The project specification team cannot know which concepts are needed until the application schema is completed. It develops the application schema by a process of iterative refinement, referring to the concept register as a source (though not the sole source) of concepts within the scope of the data product. The feature catalogue is developed later. When the FDD is introduced, populating it will be an intermediate step between developing the application schema and feature catalogue.

JW: Amendments made in accordance with the above comment.

the Domain; processing new proposals from the Domain Submitting Organization representative 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 the iterative development and refinement of the Application Schema and Feature/Portrayal Catalogues for 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, as required.
- **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 representative(s) of their group to act as Submitting Organization, Domain Control Body and Domain “Worker”. 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 their Application Schema, 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 (assigns 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 the 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](#).

Portrayal Register:

- It is anticipated that the Portrayal Register will be structured and function essentially as it exists in the current version of the Registry.

Enumerate/Codelist Registers:

Commented [TS6]: RM : The enumerate register should define literals (enumerates, listed values) in different **scopes or namespaces**, generally corresponding to attributes. Provision should be made for hierarchies (supersets/subsets). Enumerations (and codelists) are actually different datatypes for the purposes of implementations, data formats, and modeling and their treatment in the registry should facilitate that.

JW: Refer to highlighted NOTE in text. If the enumerate values are bound in the Register to an enumerated or codelist attribute data type, does this constitute an implementation of namespaces (for example, categoryOfSignalStationTraffic::berthing; actionOrActivity::berthing)?

RM: Yes.

- The intention of the Enumerate/Codelist Register is to provide the mechanism for ensuring consistency and interoperability between data created conformant to S-100 based Product Specifications. The Register is a “Hierarchical Register”, and contains all instances where a property or characteristic of a concept 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 (which may also be taken from the Concept Register) for the attribute. **This Register may also contain those attributes defined as Dictionary type Codelists through assigning the administrative URL to the attribute (see INSPIRE Registry).** The rationale behind the establishment of an Enumerate/Codelist 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. **NOTE: Discussion as to whether there should be separate “Hierarchical Registers” for enumerates and codelists (refer to INSPIRE Registry model), rather than a single Register, is required. An alternative is to have 2 Registers – the first being a “fixed list” Enumerate Register for enumerated lists that are stable (that is, are not intended/forecast to change); the second being an extensible “Codelist Register” containing lists that equate to an “open enumeration” Codelist that can be implemented in a Feature Catalogue as Enumerated or Codelist type. [TSSO: Note the reference to the “Classification Item Type” in the INSPIRE Registry below.]**
- As for the Concept Register, the Enumerate Register is “domainless”. There must only be a single instance of any concept from the Concept Register defined as a “parent” attribute in the Enumerate Register, with all possible values (codes) as used in any S-100 based Product Specification listed against that attribute. User communities may then define a “subset” of the listed values dependant on the requirement of their Product Specification.
- **Enumerated attributes are derived from the Concept Register (an example may be the “category of ...” enumerated attributes); or are . [This may not be the case – see below for discussion required as to unique “coded” lists.]**
- Data modellers working within their Domain within the Feature Data Dictionary Register access the Enumerate Register(s) using the Registry interface. They can select attributes from the Register based on their Application Schema, and bind them to the appropriate features/information/complex attributes within their Feature Catalogue, 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 Enumerated or Codelist type attributes (and ; 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.
- **NOTE possible partitioning of this Register into 2 “Domains” – a “conventional” Domain in which the attribute and its values are derived from the Concept Register; and a “classification code” Domain where the attribute is drawn from the Concept Register but the values are from a set (and mostly administered by external organizations however fixed) list of “codes” (refer to draft Register Guidelines and Conventions document, and also the first bullet above). NOTE: In the INSPIRE Registry there is actually a “Classification Item Type” (Parent?) that equates to the “classification code” Domain mentioned above. This also includes links to external Codelists.**
 - To take this a step further, perhaps the Enumerate Register can be structured so that enumerate values can be taken from the Concept Register if they are actually concepts; or registered directly in the Enumerate Register as (for want of better words) “characterizations” or “states” of a concept, in addition to classification codes. Will need to investigate this further with structures of other Registries.
- IHO GI Registry Process:
 - Data modellers working within their Domain, when requiring a registered item in the Concept Register, or a specific property or characteristic describing a concept in the Concept Register, to be an enumerate type attribute within their data model, query the Enumerate Register(s) for the existence of the attribute. If the attribute does not exist, they submit a proposal to the Register in

Commented [TS7]: RM : See the previous comment.
JW: Need use cases and examples to demonstrate why the Register would need to be partitioned.
RM: I’d like a clarification of the paragraph in question later, but pending that :
 Some concepts are very general and very broad, e.g., « status » in ENC vs. AIS vs. Lighthouse authority databases. The « berthing » term in the comment above.

Commented [TS8]: RM: Amounts to defining a derived datatype.
JW: Not sure about this comment – need to be discussed. Is there any problem with this concept?
RM: No problem. It ties into earlier comments about needing datatypes and more types of relationships between terms.

Commented [TS9]: RM : See previous comment

the same manner as would be done for the Concept Register, noting however the additional hierarchical requirement to propose both the attribute and its values (or its referencing URL if the Codelist is a Dictionary type). 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 an already existing 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 only those values (codes) for the attribute required for the Product Specification (which may or may not be the entire list of allowable values), and bound to features or complex attributes as required (with perhaps further restriction of the allowable enumerate list) in accordance with the Application Schema.

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 or Enumerate/Codelist Registers. 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 or Enumerate 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-202 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; and a member of each of the HDWG and DQWG.
- 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.
 - Example: For the S-101 ENC Domain of the FDD Register, a single person from the S-101PT (or ENCWG once S-101 is published) is appointed as the Concept Register DCB representative. When proposals are submitted to the Concept Register, the S-101 DCB representative assesses each proposal on its merits as to the action to take – this may range from accepting the proposal without consultation (if for instance there is no impact on S-101); to initiating a full consultative process within the S-101PT/ENCWG (if for instance there may potentially be significant impact on S-101).