Agenda item 9 – IALA TECHNICAL ACTIVITIES

<u>**9.4**   **e-NAV**</u>

<u>9.4.1   Documents submitted for approval</u>

9.4.1-2 Draft Guideline on producing an IALA S100 Product Specification

<u>Note by the Secretariat</u>

1   SUMMARY

In January 2010 the IHO introduced a new geospatial standard for modelling marine data and information, known as S-100. The IHO S-100 scheme is underpinned by a Registry and component Registers based on ISO 19135. The IHO owns and manages the Registry.

Within the IHO Registry, registers may be used by external Submitting Organisations. IALA Council has approved the participation of IALA in the IHO GI Registry as a Submitting Organization, and as a domain owner (i.e. the IALA domains within the Registry). The next step for IALA committees and contributors is to populate the IALA Domain within the registry. The development of product specifications comes first and then AtoNs are entered into the registry.

Product Specifications are descriptions in a standard format of a particular AtoN group. Within the IHO GI Registry, Product Specifications include everything needed to fully describe and specify a product such as data exchange protocols and references to feature and portrayal catalogues from the GI Registry.

This Guideline provides an overview of the process of populating the IALA Domain within the IHO S-100 GI Registry and a step-by-step guide through the data modelling and submission process. Guidance on the development of a product specification is provided by means of examples and templates.

 [There are two related guidelines: 1087 covers the procedures, and 1088 is a simplified description of how to prepare a product specification. This new draft Guideline is a detailed description.]

2   ACTION REQUESTED

The Council is requested to Approve the draft Guideline

International Association of Marine Aids to Navigation and Lighthouse Authorities

IALA

Association Internationale de Signalisation Maritime

AISM

IALA Guideline No.

On

Producing an IALA S-100 Product Specification

Edition 1

December 2013

Document Revisions

Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision

Table of Contents

Index of Tables

Index of Figures

Producing an IALA S-100 Product Specification

3   INTRODUCTION

In January 2010 the International Hydrographic Organization (IHO) adopted S-100, a framework geospatial standard for hydrographic and related data. IHO S-100 is aligned with the ISO 19100 series of geographic standards – thereby making the use of hydrographic and other geographic data more interoperable than using the present IHO S-57 data transfer standard.

The IHO S-100 document is underpinned by a Registry and component Registers based on ISO 19135 - *Procedures for registration of items of geographic information.*   The IHO owns and manages the Registry.

The IHO S-99 standard describes the roles, responsibilities and procedures for operating and managing the S-100 Geospatial Information Registry and its component Registers.

Within the IHO Registry, registers may be used by external Submitting Organisations.

IMO NAV at its 57th session agreed on the use of the IHO GI Registry as a baseline for the collection, exchange, and distribution of data. Supporting a greater variety of information and therefore supporting increased interoperability.   This was the first step towards the Common Maritime Data Structure (CMDS), essential for e-Navigation.

IALA Council has approved the participation of IALA in the IHO GI Registry as a Submitting Organization, and as a domain owner (i.e. the IALA domains within the Registry).

The next step for IALA committees and contributors is to populate the IALA Domain within the registry, where the development of product specifications comes first and then the required items are registered into the registry.

This guideline is intended to provide an overview of the process and a step-by-step guideline through the data modelling and submission process.

3.1   e-Navigation from concept to reality

The IALA participation in the IHO GI Registry, as described in the previous chapter, is essential to bring e-Navigation from concept to reality. It can be the linking pin between the different organizations and supports the free flow of information to support the definition of e-Navigation.

The definition of e-Navigation is *"The harmonized collection, integration, exchange, presentation and analysis of marine information onboard 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."*

e-Navigation is based on the provision of services, founded on user needs. In order to have a common understanding of the services provided in a given region, the concept of a Maritime Service Portfolio (MSP) was developed. The MSP for a given region consists of a collection of standardized Operational Services. These Operational Services are delivered through Technical Services.

A technical service is an exchange of data described by data products. A technical service can consist of more than one data product.

In order to exchange information in a harmonized way and make it easily accessible and usable, there should be a common understanding about the product. This common understanding about the product must be stored at a location which is accessible for all stakeholders who want to use it. This is what a register is used for.

A registry is simply a dictionary where definitions/specifications are kept in organised locations known as registers. The registry eases the task of developing new functionality, by providing a centralised source for finding definitions/specifications.

3.2   Objective of the guideline

The objective of this guideline is to:

- provide a common understanding of what is needed to implement products in the registry;

- explain the process from user needs to completing a product specification;

- give an understanding of what is needed to prepare a product specification;

- be a reference to those developing product specifications

- Describing the IALA internal procedures regarding the submission of product specifications and other registry entries

- explain the IALA and IHO Registry process in a step by step manner, aided by examples and formats.

- Provide a Product Specification template to be used

3.3   The IHO GI Registry

Figure 1 describes the simplified generic structure of the IHO GI Registry. The major features of the registry include registers for:

- Product Specifications – includes everything needed to fully describe and specify a product such as data exchange protocols and references to feature and portrayal catalogues from the GI Registry;

- Human-Machine Interface (HMI) – HMI definitions/specifications can also include references to CMDS entities from the GI Registry;

   (This register is named Portrayal by IHO.)

- Feature Concepts
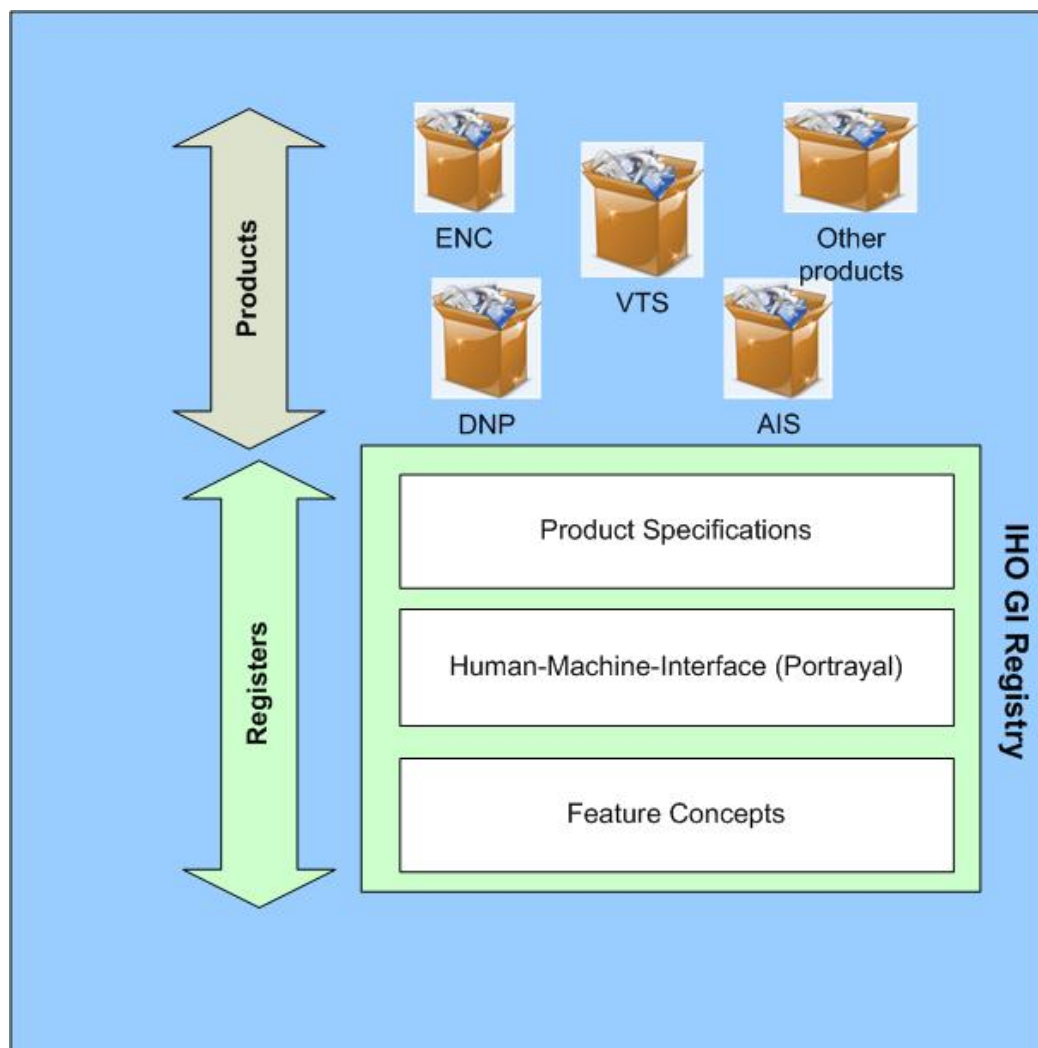
Figure 1   Simplified View of the IHO GI Registry

Note: When building a product it is recommended to reuse or extend previously created/existing entries within the registry (by reference) avoiding the need for creation of new entries as much as possible. When building a product specification for a product, it is up to the developing body to register information for new entries in the register and to make sure that the information conforms to the S-100 standard.

4   THE S-100 CONCEPT

S-100 provides a contemporary hydrographic geospatial data standard that can support a wide variety of hydrographic-related digital data sources, and is fully aligned with mainstream international geospatial standards, in particular the ISO 19100 series of geographic standards, thereby enabling the easier integration of hydrographic data and applications into geospatial solutions.

The primary goal for S-100 is to support a greater variety of hydrographic-related digital data sources, products, and customers. This includes the use of imagery and gridded data, enhanced metadata specifications, unlimited encoding formats and a more flexible maintenance regime. This enables the development of new applications that go beyond the scope of traditional hydrography - for example, high-density bathymetry, seafloor classification, marine GIS, etc. S-100 is designed to be extensible and future requirements such as 3-D, time-varying data (x, y, z, and time) and Web-based services for acquiring, processing, analysing, accessing, and presenting hydrographic data can be easily added when required.

The S-100 development and maintenance process is specifically aimed at allowing direct input from non-IHO stakeholders, thereby increasing the likelihood that these potential users will maximise their use of hydrographic data for their particular purposes. The IALA Domain within the IHO Registry is being created to provide standardized information in fields such as ATON, VTS and AIS support of the e-Navigation initiative.

4.1   Structure of the Registry and Registers

4.1.1   Registers

The Registry consists of five types of Registers:

1   Feature Concept Dictionary (FCD) register.

2   Product Specifications Register.

3   Data Producer Code Register.

4   Metadata Register (not yet available).

5   Portrayal Register (not yet available).

The **Feature Concept, Portrayal and Metadata Registers (1)** are, in effect, managed lists or dictionaries of items. Selections from the Feature Concept and Portrayal Registers are used to define Feature and Portrayal Catalogues used in individual Product Specifications. The Metadata Register is used to create product specific metadata schemas.

The **Product Specification Register (2)** is a list of S-100 based Product Specifications created by recognized organizations describing meta information about the content, purpose, version, location and availability of those Product Specifications.

The **Data Producer Code Register** (3) is the authoritative list of the codes that can, if required, be stipulated in Product Specifications to identify the producers of a particular data product

The Registers are maintained by IHO bodies in which items that directly support the official hydrographic products and services required to meet the chart and publications carriage requirements of the Convention on the Safety of Life at Sea (SOLAS) are registered. Also organizations recognized by the IHO can register items in the Registers. This can be through extending items already in the Register or by registering new items.

Figure 2   The IHO GI Registry

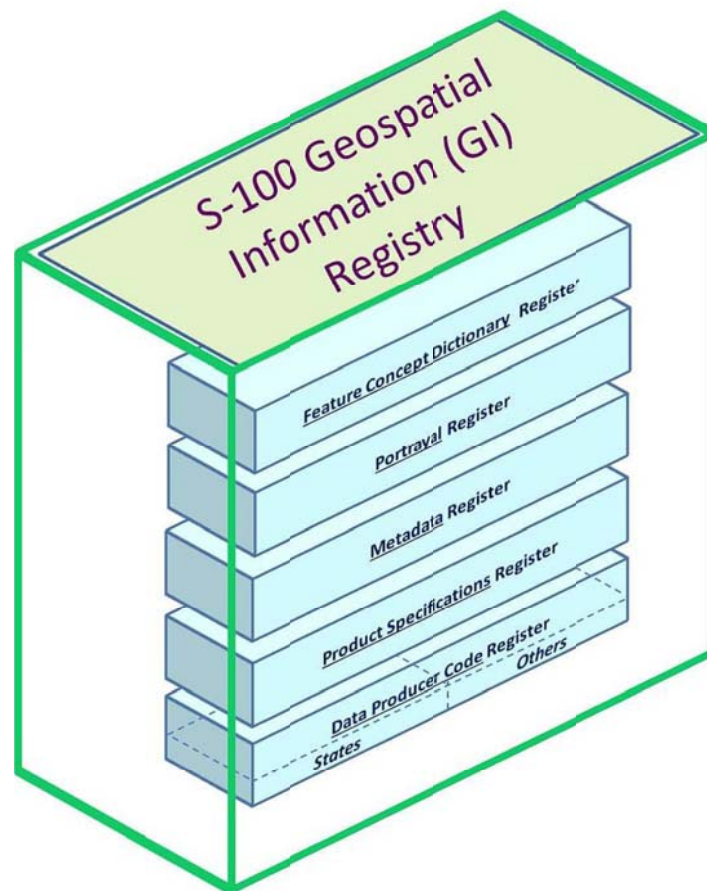4.1.2   Domains

Within the Feature Concept, the Portrayal and the Metadata Registers each entry is assigned to a recognised domain. The purpose of designating domains and a related Domain Control Body is to ensure that the key stakeholders (as represented by the domains) are consulted in any subsequent proposals to adjust items contained in a Register.
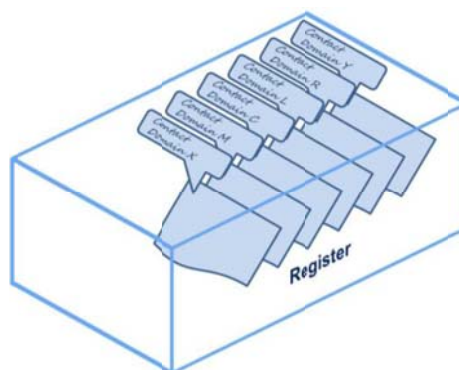

Figure 3   Domains within Registers

4.1.3   IALA Domain

The IALA Domain is created in the registry and is intended to compile e-Navigation related registry data to facilitate the efficient exchange of information between shore-side and/or shipboard stakeholders. To accomplish this, both sides must have a common understanding about the information and how the data is provided. To make sharing of data platform and system independent, detailed description of the information properties is necessary.

4.1.4   IHO GI S-100 document

S-100, the IHO Universal Hydrographic Data Model, comprises twelve related parts that give the user the appropriate tools and framework to develop and maintain hydrographic related data, products and registers. S-100 is written for different audiences; Product Specification Developers, Software Developers for production environments as well as viewer environments. It includes the standards specified for hydrographical and related information, methods and tools for data management, processing, analysing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations. By following this set of geospatial hydrographical standards, users will be able to build constituent parts of an S-100 compliant product specification.

The purpose of this guideline is that the reader does not need to know all the different parts of S-100. By means of examples and templates the need to know information about the different parts of S-100 are discussed so that a product specification can be developed.

4.2   IALA Domain specific registry information

When developing this guideline it became clear that some of the IHO S-100 parts will have to be interpreted in another context for usage in the IALA domain.

Erreur ! Source du renvoi introuvable. gives some additional information for the specific use in the IALA domain. This additional information is given to place the S-100 description of the different parts in a more IALA domain context.

Table 1   S-100 parts for IALA use

Part Title	Part Number	Specific guidance for IALA use
Conceptual Schema Language	S-100 Part 1	*The use of UML is mandatory for describing the data-model of a product. The part will apply in full.*
Management of IHO Geospatial Information Registers	S-100 Part 2	*For the IALA Domain, the management of the IALA registers will apply, and these management procedures will be part of the register. Consequently it is clear to developers and authorities how product specifications can be submitted. Procedures on amending existing product specifications are treated similarly.*
Feature Concept Dictionary Registers	S-100 Part 2a	*The need for a register to store definitions applies for the IALA Domain. In the Feature concept dictionary for the IALA Domain the Features for the e-Navigation/IALA domain are registered.*
General Feature Model and Rules for Application Schema	S-100 Part 3	This part applies in full for the IALA Domain. The General Feature Model and the Application Schema are the most important items.
Metadata	S-100 Part 4a	The knowledge about the quality of data is not limited to the hydrographic organizations but to every supplier of data. Therefore this part is equally important for the IALA Domain.

Part Title	Part Number	Specific guidance for IALA use
Feature Catalogue	S-100 Part 5	The feature catalogue will be a part of the IALA product specification. When populating the IALA Domain of the registry it is possible that definitions of features are yet to be developed and be registered in the Feature Concept Dictionary. It is also possible to refer to an existing feature in the Main(IHO)domain of the register.
Coordinate Reference Systems	S-100 Part 6	WGS 84 as default but others can be applicable
Spatial Schema	S-100 Part 7	*The usage of this part for the IALA Domain is not yet known, possibly referencing to the existing reference systems in the Main(IHO)domain of the register can be sufficient.*
Imagery and Gridded Data	S-100 Part 8	*At this time not applicable for IALA usage.*
Portrayal	S-100 Part 9	*The use of a portrayal register could lead to generic standards for portrayal and handling of information, providing familiarity and improving the effectiveness of training. The portrayal catalogue is optional for IALA, but can be applicable depending on the use case of the product.*
Encoding Formats	S-100 Part 10	*The type of coding is also dependent on the type of carrier which will be used for the exchange of the data. Applies for IALA.*
Product Specifications	S-100 Part 11	*The required structure for a product specification for the IALA domain is the same as for the IHO domain. However the product does not have to be related to a geographic product. It can be any object which is intended to be exchanged and relates to the user need and goal of e-Navigation.*
S-100 Maintenance Procedures	S-100 Part 12	*Specifically for maintenance of S-100 not applicable for IALA product specification development.*

4.3   From User Need to Product Specification

The products in the e-Navigation context are derived from user needs. These user needs, which are high level and functionally specified have to be transformed to product requirements in order to realize the needed functionality. The development of product requirements drives the data model, which in turn generates into a product specification and the items to be registered. This is the task of the product specification developer. In Figure 4 the global idea of the route from user need to product specification is shown.

In order to develop a product specification it has to be clear what the product should be. For the provision of e-Navigation this product is supposed to be a part of a Maritime Service Portfolio (MSP). The authority responsible for the relevant service creates a description of the desired product and the applicable user needs. Then it is up to the product specification developer to check the registry and investigate if the needed features already exist. In cases where the feature does not exist, a new feature has to be added to the feature concept dictionary (FCD).

Next a data-model has to be produced, either by means of a conceptual schema language or by means of an encoding specific language. Finally the previous and other information is captured in a document called a product specification. This document will then be registered, after an approval process, in the product specification register of the GI Registry.
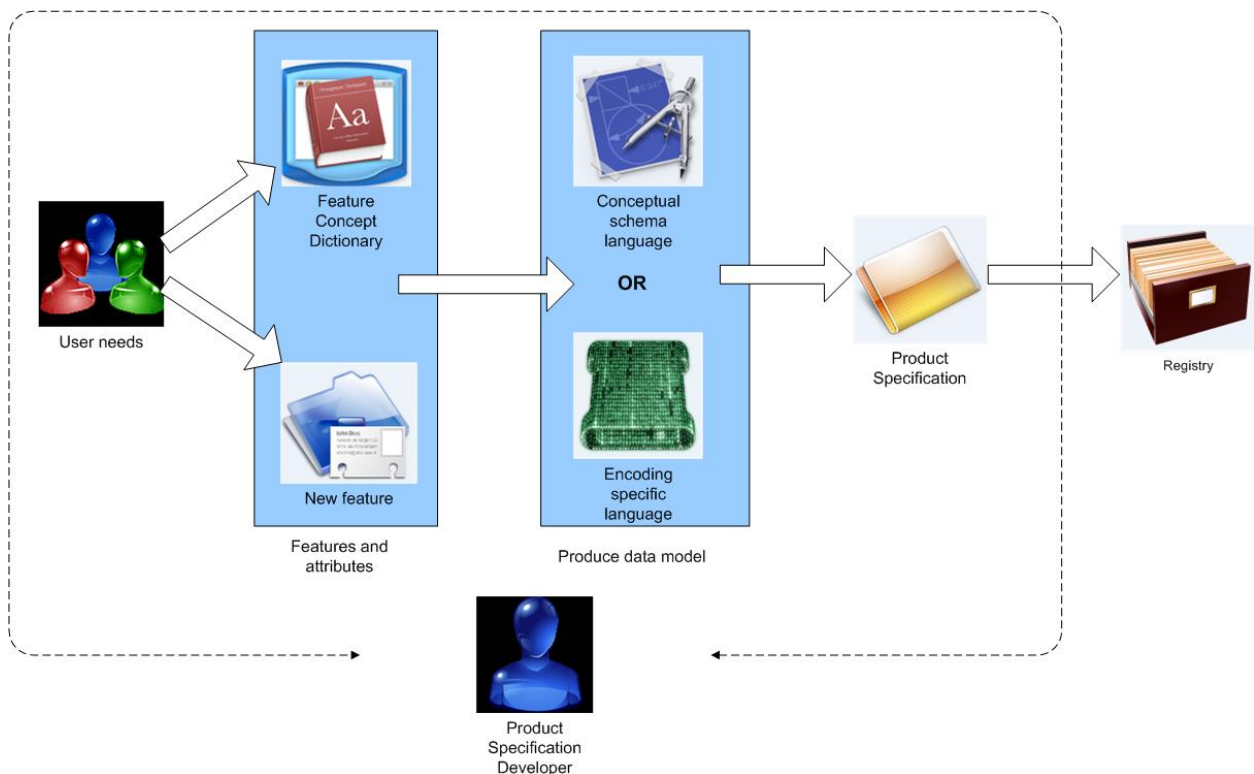
Figure 4   Transformation of a User Need into a Product Specification

For the development of a product specification a level of expertise is necessary. This level of expertise is not only necessary on the developer side but also the service provider needs to have some understanding of the process. The right mixture of expertise consists of S-100 experts and understanding of the product requirements and context of the product within the e-Navigation scope.

4.4   Data modelling, a general example

In figure 5 a simple example is given about an everyday situation and how this would relate to features and types in UML objects.

Suppose you wanted to provide a service intended to provide a car driver with information about the cheapest gas stations during his journey.

The service or product would require information about:

- the road,
- the location of petrol stations
- the price of fuel.

A data model could look like figure 5.

Task:
Filling a car with petrol

User needs

Find a petrol station
Determine the cheapest best value option
Navigate to the petrol station

Data Product requirements

Must contain point data for petrol stations
Must contain road network data which supports routing
Must include price data for petrol
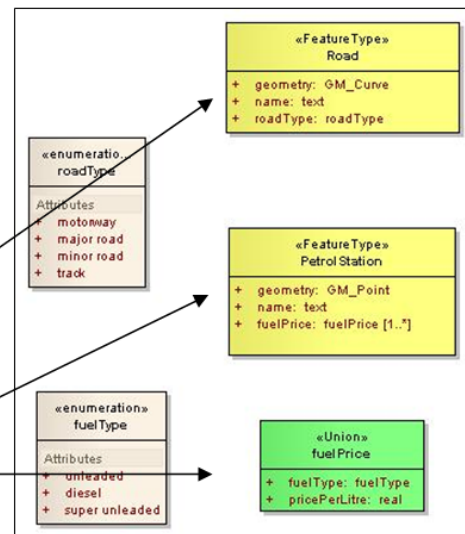
Figure 5   Example - petrol

4.4.1   e-Navigation Example

To explain the use of the registry and the need for a product specification in a semi technical way an example is used, let us assume the following case:

From the user needs it is derived that the wind speed in a given area needs to be provided to the maritime stakeholder. The provision of the wind speed in advance for a certain area could be useful for decision support regarding navigation and berthing.

The first stakeholder who wants to provide the service will have to write a product specification. In this specification all the relevant information is noted and after an approval process, the product specification is added to the registry. Now the product specification can be used for the development of an application, either on the ship side or shore side.

Next there is a need for a shipboard system or application to have this information regarding the wind speed in a given area.

The developer of the shipboard system or application will search the registry to find out if this service is already provided and he will find the product specification. This will provide him, amongst other items, the following information:

- XML is used for encoding;

- Wind speed is provided in meters per second.

With this information about the data the developer can build his application. He knows where the information can be retrieved and how he must handle the data, perhaps he has to make an extra calculation if his program works with Miles per hour.

The same applies for information providers. If another body wants to provide a wind speed service it can first search the registry to see if this service already exists. There it will find the product specification as previously mentioned. Based on that information the developer knows how the data needs to be encoded and that the wind speed needs to be provided in meters per second. No new development is needed and this saves time and costs.

Figure 6 shows the example in a graphical way.
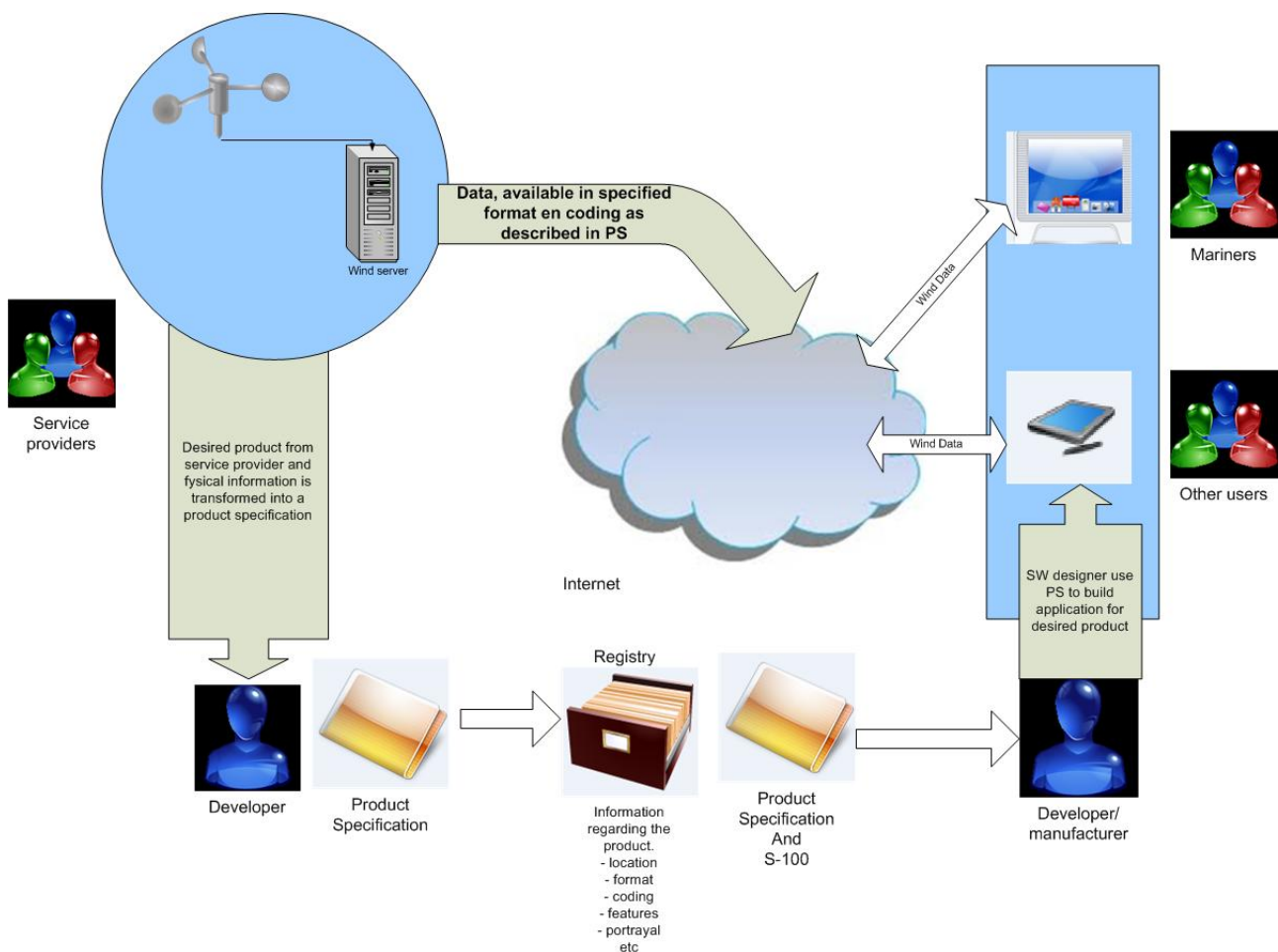
Figure 6   Graphical Representation of the Product Specification process and the technical data exchange process

In the next chapters the management of the IALA domain is explained, a more detailed explanation is given about the S-100 registry concept and more information on how to develop a product specification.

5   MANAGEMENT OF IALA DOMAINS

5.1   The IHO Registry – IALA and Domain Management Relationship

The purpose of this section of the guideline is to provide information regarding the interaction between the IALA Domain, the International Hydrographic Organization (IHO), and the Registry. It will also describe the roles, responsibilities and procedures for IALA as a Submitting Organization to the IHO Registry, as described by the governing documentation of IHO Standards S-100 and S-99. The overall context of IALA's involvement in the IHO Registry is considered, in particular the move towards a Common Maritime Data Structure (CMDS) and the proposed IMO/IHO Harmonization Group on Data Modelling (HGDM).

IALA has developed these procedures solely to manage the IALA domains and its role as a Submitting Organization within the context of the Association. Should there be any conflict between this Guideline and IHO standard S-100 or S-99, IALA should defer to the IHO documentation.

5.1.1   IALA as a Domain Owner

Recognising that the IALA domains comprise several functional domains (e.g. VTS, AtoN, World-Wide Radio Navigation (WWRN) and Formal Risk Assessment) in the Feature Catalogue Dictionary, Portrayal and Metadata Registers, as well as several organizational domains in the Product Specification Register, it is envisaged that IALA will become a domain owner.

5.1.2   Management of IALA Domains

The overall management responsibility of IALA for its domains in the IHO Registry is distributed over three types of managerial roles:

1   IALA Domains Management.

2   IALA Field Managers.

3   IALA Product Specification Developer.

As a Domain Owner, IALA will require interaction within the IHO's Domain Control Body and the adherence to the timelines of the IHO's Registry management processes. This activity affects the work of the IALA Domain Management and could lead to the involvement of IALA Field Managers and IALA Product Specification developers. The IALA committee working structure is not suited to meet the IHO's S-99 specified timelines of the product specification approval process and involvement between meetings will be necessary. Membership to the IHO's Domain Control Body provides the Submitting Organizations the opportunity to advocate their own proposals.

5.1.2.1   IALA Domains Management

The IALA Domains Management resides in the IALA Secretariat and coordinates the activities of each of the IALA Field Managers and acts as the single point of contact with the IHO.

5.1.2.2   IALA Field Manager

In the context of IHO Registry, IALA currently recognises the following Product Fields: VTS, AtoN Information, IWRAP and WWRN. Fields comprise all relevant domains associated with that Field, e.g. the VTS Field would comprise the IALA VTS domain from the Product Specification Register, the VTS domain from the Feature Concept Dictionary Register, the VTS domain from the Portrayal Register and the VTS domain from the Metadata Register.

Each Field has at least one IALA product and one IALA Product Specification. The IALA Field Manager harmonises the different products / Product Specifications within that Field. The IALA Field Manager also considers the usage of entries by others in his Field.

5.1.2.3   IALA Product Specification Developer

A developer is appointed to manage each IALA Product Specification. An IALA Product Specification Developer coordinates the development of an IALA Product Specification, coordinates the usage of existing entries in the IHO Registry that are used by that IALA Product Specification and coordinates the creation of new entries required by that IALA Product Specification. An IALA Product Specification Developer is able to draw on any Register in the IHO Registry.

A list of the individual Product Specification Developers and Field Managers is maintained by the IALA Secretariat.

5.1.2.4   IALA Organizational Chart
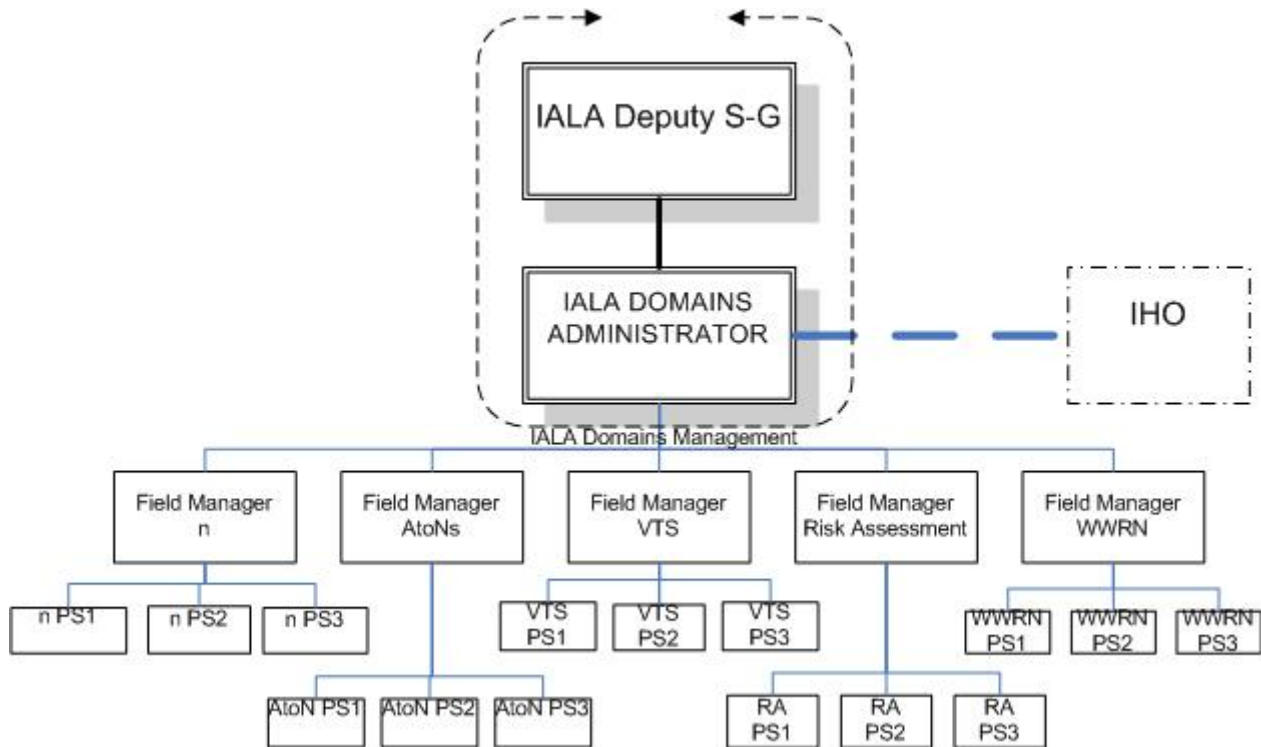
Figure 7   IALA Domains organisation

5.2   Procedure on registering product specifications under development

In order to prevent several organizations working on similar product specifications it is necessary that those launching projects are known to the community. Organizations can check if the development of a product specification is already started and contact the organisation regarding the details. Then they can decide if this product specification will become a joint effort or co-development, which will save time and costs.

Appendix 3 contains a template which will have to be filled in by the product specification developer and sent to the IALA Field Manager. The IALA Field Manager will send the information to the IALA Domains Manager. The Domains Manager will publish this information within the IALA Domain.

5.3   Procedure on getting "draft status" for a Product Specification

If a product specification is at the stage that an application schema is ready, the PS developer can submit his application schema to the IALA Field manager. After review the Field manager will send this to the IALA Domains Manager and request that the status from "launching project" is changed to draft status indicating to the community that the product specification is nearing completion.

5.4   Procedures for Submitting a Product Specification

Representatives of recognized organizations may submit proposals for additions of a new Product Specification in the Product Specifications Register or for the Clarification, Supersession, or Retirement of existing Product Specification in the Register. Requests are to be submitted to the IALA Domain administrator by using the mechanisms[1] provided by IALA. After approval the IALA Domain administrator will submit the request to IHO using the Registry web interface. The process for submitting proposals for the registration of Product Specifications is illustrated in figure 8.

---

[1]   These mechanisms have to be developed

Figure 8   Processing of Proposals

5.4.1   Submission of Proposals

The organization making a submission shall ensure that all proposals:

- are complete; and

- a copy of the final version of the new Product Specification is made available to the IALA
  Domain administrator.

5.4.2   IALA Domain Administrator

The IALA Domain administrator will:

- receive product specifications from product specification developers;
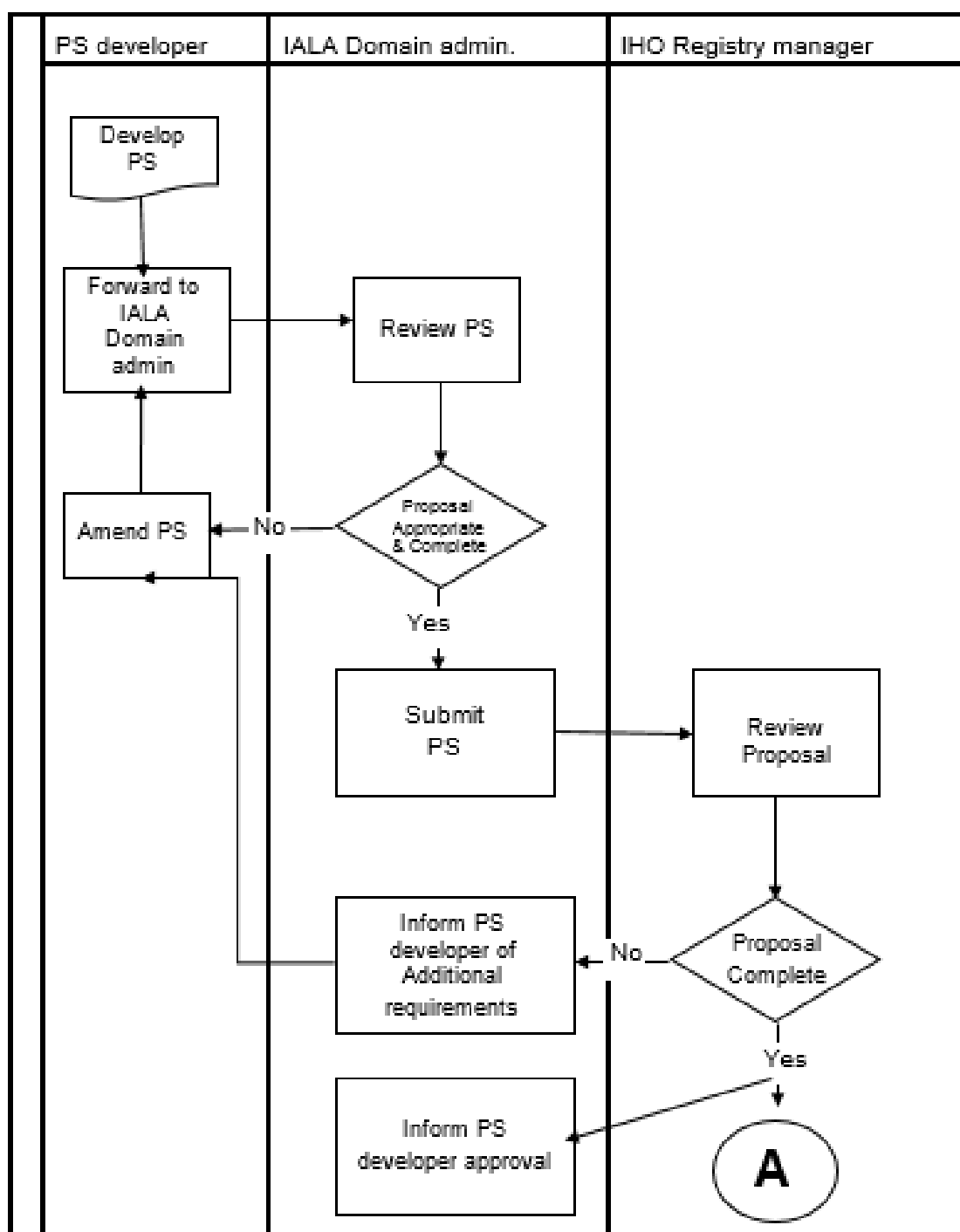
- determine if the proposed item does or does not fall within the scope of the Register; or

- if a registered item (or similar) to the proposed item already exists;

- review product specifications for completeness;

- return product specifications to the field managers if incomplete; or

- update the item management record, with the status set to 'pending'.

The IALA Domain administrator shall ensure the following IHO acceptance criteria have been satisfied:

- S-100 is used as the underlying standard (organizations are encouraged to populate Feature Catalogues, either using existing entities registered in the GI Registry or proposing new ones where appropriate);

- any identification number of a plain language title used does not infer that it is an IHO standard or that it has received any endorsement or approval of the IHO; and

- the content description is in plain language.

After submission the Domain administrator shall:

- serve as the point of contact and negotiate with IHO regarding any changes required to a proposal; and

- inform the product specification developer of the results of each proposal.

If the proposal is accepted by the IHO registry manager, the IALA Domain administrator informs the product developer and the field manager about the acceptance. If a proposal is not accepted by the IHO registry manager, the Domain Administrator shall:

- inform the product specification developer of the 30 working day deadline for appealing the decision of the IHO registry manager and

- make the results of the approval process available to the product specification developer.

5.4.3   Appeals

A product specification developer may appeal to the IALA deputy SG if it disagrees with the decision of the Domain administrator to reject a proposal for the inclusion of a Product Specification in the Register. An appeal shall contain at a minimum a description of the situation, a justification for the appeal, and a statement of the impact if the appeal is not successful.

The Submitting Organization shall submit its appeal to the Domain administrator.

The Domain administrator shall:

- forward the appeal to the IALA Deputy Secretary-General as appropriate; and

- inform the appellant of the decision.

5.4.4   Withdrawal of Proposals

Product Specification developers may decide to withdraw a proposal at any time during the approval process.

The Domain administrator shall then:

- change the proposal management disposition to 'withdrawn' and the value for *date Disposed* to the current date; and

- keep track of the proposal and report the withdrawal in the next periodic report.

5.5   Procedures for Feature Concept, Portrayal and Metadata Registers

In the development process of a product specification it can be necessary to register new features or amend existing features. Also the registration of items in the metadata and portrayal registers can be relevant. In the following chapters a procedure to do so is described; this procedure is derived from IHO Publication S-99.

5.5.1   Introduction

Submitting Organizations may submit proposals for new items, or for clarification, supersession, or retirement of registered items. Proposals are to be submitted by using appendix 2. After approval the IALA domain administrator will submit the proposal using the mechanisms provided in the Registry web interface.

5.5.2   Addition of registered Items

Addition is the insertion into a Register of an item that describes a concept not adequately described by an item already in the Register.

5.5.3   Clarification of Registered Items

Clarification corrects errors in spelling, punctuation, grammar or improvements to content or wording. A clarification shall not cause any substantive semantic change to a registered item. The three characteristics that can be clarified are definition, other references, and remarks.

5.5.4   Supersession of Registered Items

Supersession of an item means any proposal that would result in a substantive semantic change to an existing item. Supersession shall be accomplished by including one or more new items in the appropriate Register with new identifiers and a more recent date. The original item shall remain in the Register but shall include the date at which it was superseded, and a reference to the items that superseded it.

5.5.5   Retirement of Registered Items

Retirement shall be effected by leaving an item in the Register, but by marking it as "*retired*", and including the date of retirement.

5.5.6   Development of Proposals

The IALA Domain administrator shall manage the development of proposals for entries or amendments to the Feature Concept, Portrayal and Metadata Registers from within their respective Working Groups, communities or organizations.

5.5.7   Submission of Proposals

The process for submitting proposals for the registration of items in the Feature Concept, Portrayal and Metadata Registers is illustrated in Figure 9.

The IALA Domain administrators shall:

a)   receive proposals for the registration of items from proposers within their respective Fields, Working Groups, communities or organizations;

b)   ensure that all proposals are logical and complete and are consistent with other features, attributes and enumerated values; and

c)   submit proposals to the appropriate Register and domain.

A Register Manager shall:

a)   receive proposals from Submitting Organizations,

b)   review proposals for completeness,

c)   return proposals to the IALA Domain administrator. if incomplete, and

d)   update the item management record, with the status set to '*pending*'.

A Register Manager shall use the following criteria to determine if a proposal is complete:

a)   the proposal is from a recognized Submitting Organization,

b)   the proposed item falls within the scope of the Register or domain, and

c)   a registered item (or similar) to the proposed item does not already exist.

The Register Manager shall then submit the proposal to the Domain Control Body[2] in accordance with the following submission process.

---

[2] The Domain Control Body (DCB) shall consist of a representative of each of the domains recognized in each Register type.

**Submission Process -
Feature Concept, Portrayal and Metadata Registers**

Proposer	IALA Domain admin.	Register Manager

Develop Proposal

Forward to Submitting Organization

Review Proposal

Amend Proposal ← No ← Proposal Appropriate & Complete

Yes

Review Proposal

Inform Submitting Organization of Additional requirements ← No ← Proposal Complete
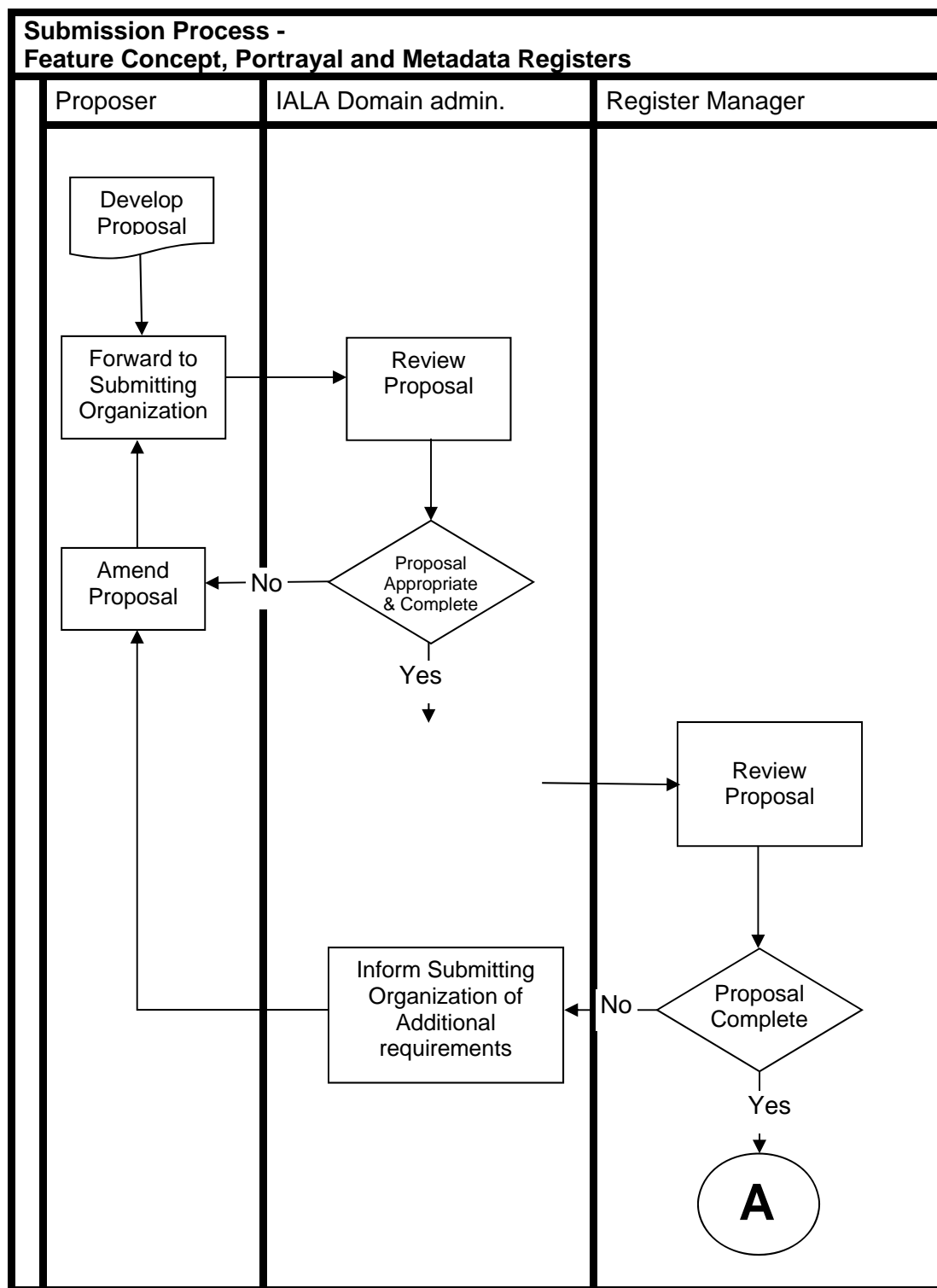
Yes

A

Figure 9   Processing of Proposals

5.5.8   Approval Process

The process for determining the acceptability of proposals is illustrated in Figure 10. The approval process shall normally be completed within a time period of 60 days. In the case of appeal this period shall be extended to 90 days.

The Register Manager shall ensure the following:
a)   if the proposal is for clarification or retirement of a Register item, forward the proposal to the Domain Control Body; or
b)   if the proposal is for registration of a new item or supersession of an existing Register item:
1)   assign an *item Identifier* to the new or superseding item,
2)   set the *status* of the item to '*not Valid*'; and
3)   inform the Domain Control Body of the new proposal within five working days.

The Domain Control Body can decide to:
a)   accept the proposal without change,
b)   accept the proposal subject to changes negotiated with the IALA Domain administrator, or
c)   not accept the proposal.

Criteria for not accepting a proposal include:
a)   the specification of the item is incomplete or incomprehensible,
b)   an identical or very similar item already exists in the Register or in another Register of the Registry,
c)   the proposed item does not belong to an item class included in this Register,
d)   the proposed item does not fall within the scope of an appropriate Register, or
e)   the justification for the proposal is inadequate.

Each Domain Control Body member shall inform the Register Manager of their working group / organization's decision, and the rationale for that decision, within 30 days of receipt of the proposal. Nil returns will be taken as acceptance of the proposal.

The Register Manager shall:
a)   serve as the point of contact if there is a need for negotiations between a Submitting Organization and a Domain Control Body regarding any changes required to a proposal that may be specified by the Control Body as a condition of acceptance; and
b)   inform the IALA Domain administrator of the results of processing a proposal.

If the decision of the control body is positive, the Register Manager shall in accordance with policies for the Register:
a)   complete the proposal management record with status set to '*final*', disposition set to '*accepted*', and *date Disposed* to the date of the Domain Control Body's decision,
b)   make approved changes to the content of the Register item,
c)   set the Register item status to '*valid*', '*superseded*', or '*retired*', as appropriate.

If the decision of the control body is negative:
a)   update the proposal management record by setting status to 'tentative', disposition to 'not Accepted', and date Disposed to the date of the Domain Control Body's decision,
b)   inform the IALA Domain admin. of the 30 working day deadline for appealing the decision of the Domain Control Body, and
c)   make the results of the approval process available to all interested parties.

Submitting organizations shall:
a)   negotiate with the Domain Control Body through the Register Manager, regarding any changes to their proposals that are specified by the Domain Control Body as a condition of acceptance; and
b)   make known to the proposer and within their respective communities or organizations the decisions taken on proposals by the Domain Control Body as transmitted to them by the Register Manager.
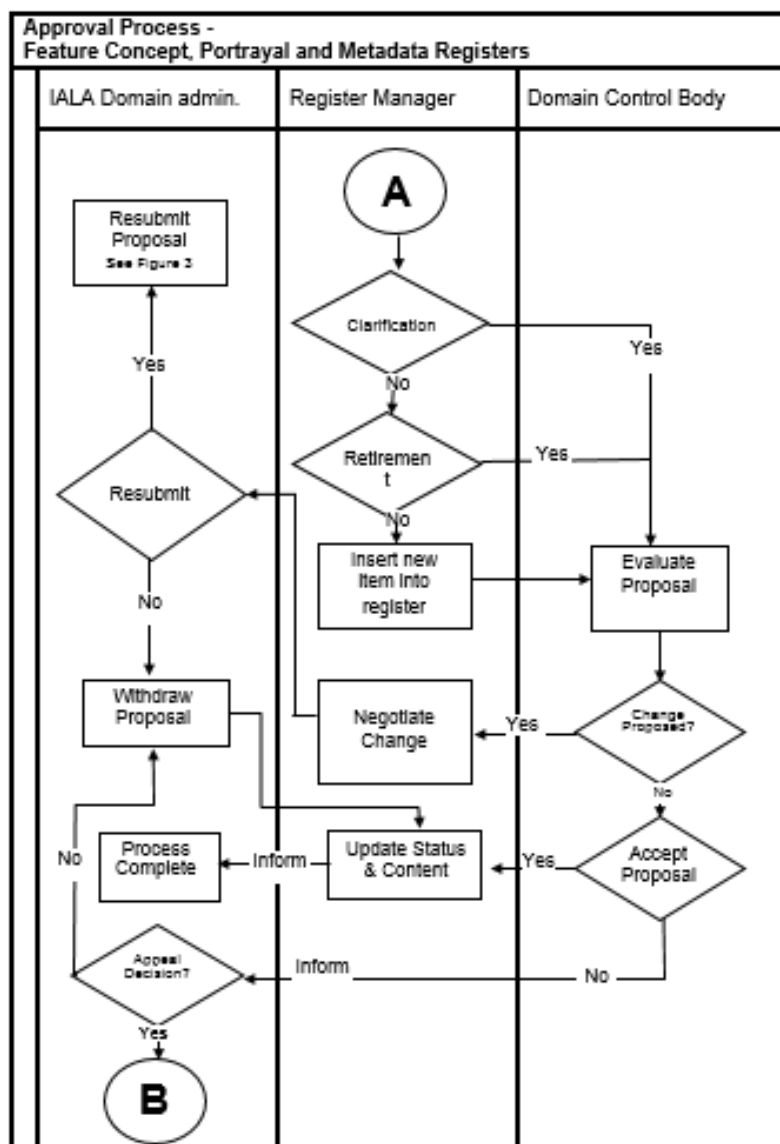
Figure 10   Approval Process

5.5.9   Withdrawal of Proposals

Submitting organizations may decide to withdraw a proposal at any time during the approval process.
The Register Manager shall then:
a)   change the proposal management status from 'pending' to 'final',
b)   change the proposal management disposition to 'withdrawn' and the value for *date Disposed* to the current date, and
c)   keep track of the proposal and report the withdrawal in the next periodic report.

5.5.10 Appeals

A Submitting Organization may appeal to the Executive Control Body if it disagrees with the decision of a Domain Control Body to reject a proposal for addition, clarification, modification, retirement, or supersession of an item in a Register. An appeal shall contain at a minimum a description of the situation, a justification for the appeal, and a statement of the impact if the appeal is not successful. The appeal process is illustrated in Figure 11.

The Registry Manager shall:
a)   determine if the decision regarding a proposal for registration is acceptable; and
b)   if not, submit an appeal to the Register Manager.

The Register Manager shall:
a)   forward the appeal to the Executive Control Body; and
b)   if there is no appeal by the deadline for submitting an appeal, the Register Manager shall change the status of the proposal management record to 'final' and change the *date Disposed* to the current date.

The Executive Control Body shall:
a)   process the appeal in conformance with its established procedures;
b)   decide whether to accept or reject the appeal; and
c)   communicate the decision to the Register Manager.

The Register Manager shall:
a)   update the proposal management record fields disposition and *date Disposed*;
b)   update the Register item status; and
c)   provide the results of the decision to the Domain Control Body and to the IALA Domain administrator.

The IALA Domain administrator shall:
a)   make the results of the appeal known within their Working Group, community or organization.
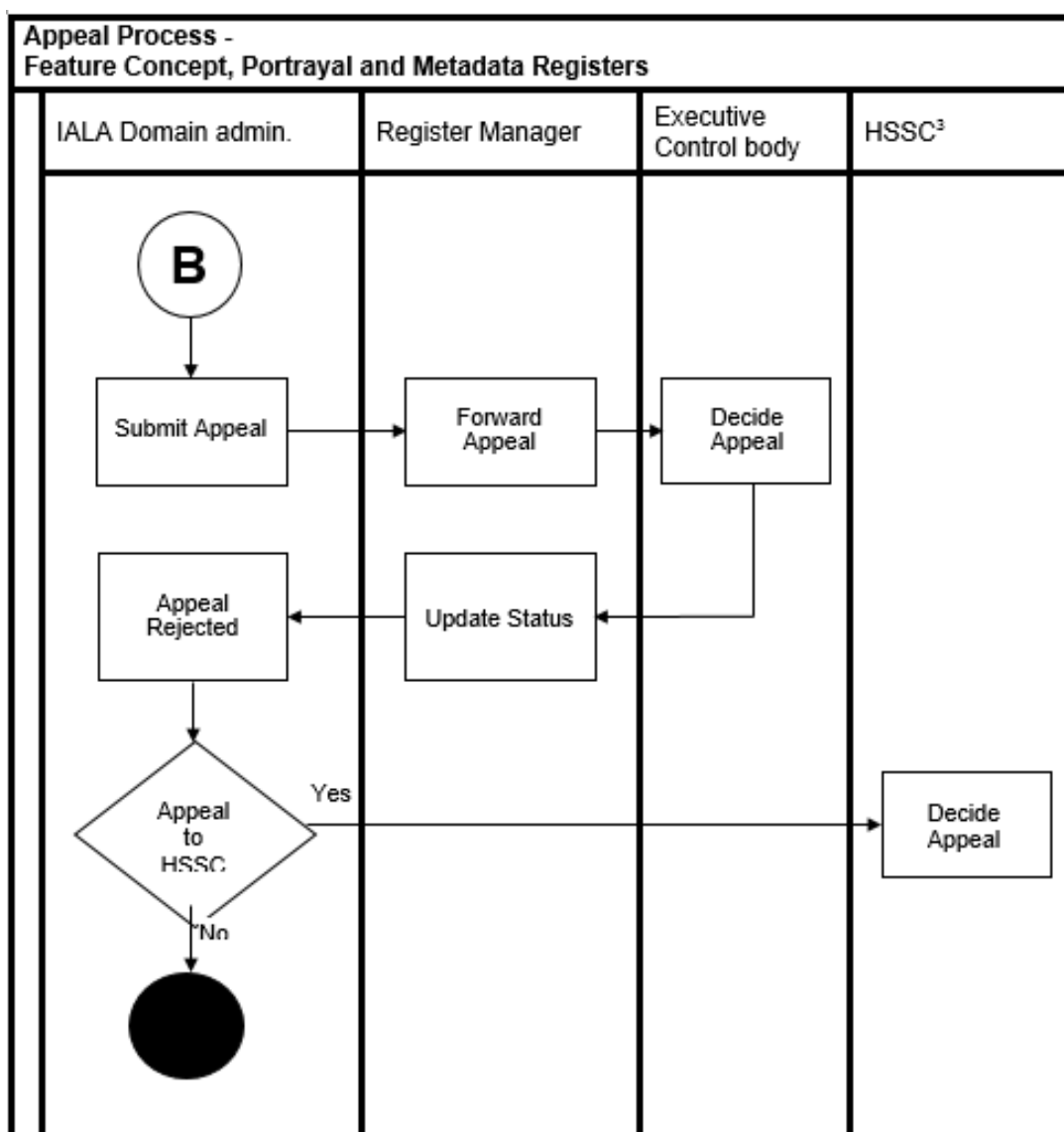
Figure 11   Appeal process

6   DEVELOPING A PRODUCT SPECIFICATION

6.1   Introduction

The purpose of this chapter is to describe the process that can be followed to create IALA Domain product specifications based on the S100 standard and the implementation of the product specifications in the Geospatial Information registers.

In more detail an explanation is provided regarding the purpose of a product specification, the applied concepts within a product specification, an overview of the Geospatial Information registry and a recommended process that can be followed to create a product specification.

6.2   Product specification

A product specification allows the standardization of a data product according to the S-100 framework, in order to specify, implement and exchange a data product within the context of Maritime Service Portfolio (MSP) and e-Navigation. The MSP for a given region consist of a collection of standardized Operational Services, which are executed by Technical Services. The technical services make use of 'data products' to exchange data. Examples of such IALA related data products are AtoN, IVEF or AIS Application Specific messages. Product specifications may be created and used on different occasions, by different parties and for different reasons.

A product specification can be summarized as a precise technical description, defining a data product within the S-100 framework. It describes the features, attributes and relationships of a given application and their mapping to a means of data exchange, such as exchange sets (AtoN) and dynamic data streams (IVEF).

For this purpose it includes general information for data identification as well as information for data content and structure, reference system, data quality aspects, data capture, maintenance, delivery and metadata.

The applied methodology for product specifications is derived from the IHO profile of ISO 19131 and ensures a clear and consistent structure for data product specifications being consistent with the other standards that have been developed as part of the IHO S-100 framework.

For the creation of a data product specification, the 'IALA Product Specification Template' must be used. The several components making part of the product specification and the applicable template are described in the following paragraphs.

6.3   Product specification template

The Product specification template defines a standardized method to define and describe the product specifications. In this paragraph the main components as applicable in the template are described. The template is a part of this guideline as Appendix 1. The template contains all the relevant information that is necessary when developing a product specification. In Appendix 1 a clarification is included for each information item of the product specification.

6.4   Concepts used in a product specification

When developing a product specification, a developer will notice that there are some general concepts used in a product specification creation. In this section the main concepts used in development of a product specification are presented in a stepwise manner.

6.4.1   Unified Modeling Language

UML is used as the modelling language in S-100. An understanding of UML class diagrams is needed to produce a product specification. Wikipedia provides an overview via:

http://en.wikipedia.org/wiki/Unified_Modeling_Language

6.4.2   Application Schema

An application schema is a **fundamental** element of any S-100 based product specification. The application schema serves two purposes:

1   It achieves a common and correct understanding of the content and structure of data within a particular application field.

2   Secondly, it may provide a computer readable schema for applying automated mechanisms for data management. This can be achieved in an XML document. The two roles imply a stepwise process for creating an application schema. The steps can be briefly described as:

- Making a conceptual model of the application with concepts defined in the **General Feature Model**.

  This task consists of identifying feature types, their properties and constraints.

- Describing elements of the application schema in the **Conceptual Schema Language** used in S-100 and according to the rules for Application Schemas and the General Feature Model.

- Integrating the formal application schema with other standardized schemas, (spatial schema, quality schema, etc.) into a complete application schema.

For the creation of an application schema several software tools can be used. Enterprise Architect is one of the tools that can be used.

The application schema is subject to a number of rules.

1   All classes used within an application schema for data transfer shall be instantiable.

2   The identification of each application schema shall include a name and a version. The inclusion of a version ensures that a supplier and a user agree on which version of the application schema describes the contents of a particular dataset. A system of defining unique names and versions for S-100 application schemas shall be defined.

3   In UML, an application schema shall be described within a PACKAGE, which shall carry the name of the application schema and the version stated in the documentation of the PACKAGE.

4   An application schema shall be documented. A means of documenting application schemas for S-100 shall be defined in order to ensure consistency across S-100 product specifications.

5   The documentation of an application schema in UML may utilize the documentation facilities in the software tool that is used to create the application schema, if this information can be exported.

6   If a CLASS or other UML component corresponds to information in a **Feature Catalogue**, the reference to the catalogue shall be documented.

7   Documentation of feature types in an application schema shall be in a catalogue with a structure derived from the General Feature Model, such as in a **Feature Catalogue**. This could be in text format or XML accompanied by a style sheet (XSLT) used to create a text version.

For detailed description of Application Schemas see S-100 Part 3.

6.4.3   General Feature Model

The content of a data product is structured in terms of objects. The general feature model has two concepts for objects.

1   **Features** defined together with their properties. A feature is an abstract representation of real world phenomenon. Features have two aspects – feature type and feature instance. A feature type is class and is defined in a **Feature Catalogue**. A feature instance is a single occurrence of the feature type and represented as an object in a data set.

2   **Information Types** – An information type is a class of object that is defined in a **Feature Catalogue**. An instance of an information type is an identifiable unit of information in a data set. Information types have only thematic attribute properties. An instance of an information type may be associated with one or more feature instances or other instances of information type.

An example of a feature could be a buoy and an example of an information type could be a maintenance report for a buoy.

See S-100 Part 3.

6.4.4   Attribute types

S100_GF_AttributeType: The class S100_GF_AttributeType is the S-100 realization of GF_AttributeType. It is largely identical to the ISO 19109 class but differs in the following way. The association attributeOfAttribute is not realized in the S-100 GFM. S-100 introduces, instead, the concept of complex attributes. Complex attributes are described further in ISO 19109 sub clause 7.4

6.4.5   Geometry types

S-100 includes definitions of 1D and 2D geometry types. If a geometry type is required that is not specified in S-100 Part 7 Spatial Component, an application shall be submitted to TSMAD for it to be added to the framework.

7   EXAMPLES OF THE PRODUCT SPECIFICATION PROCESS

In the next chapters some examples are given of how to develop the content for a product specification. Some real situations are given and the derivations of some of the main information items are explained. The information gained from this process can then be transformed into a product specification by using the Template.

7.1   Conceptual Viewpoint

Figure 12, taken from ISO 19109, illustrates the process of converting a real situation into a geographic data model:
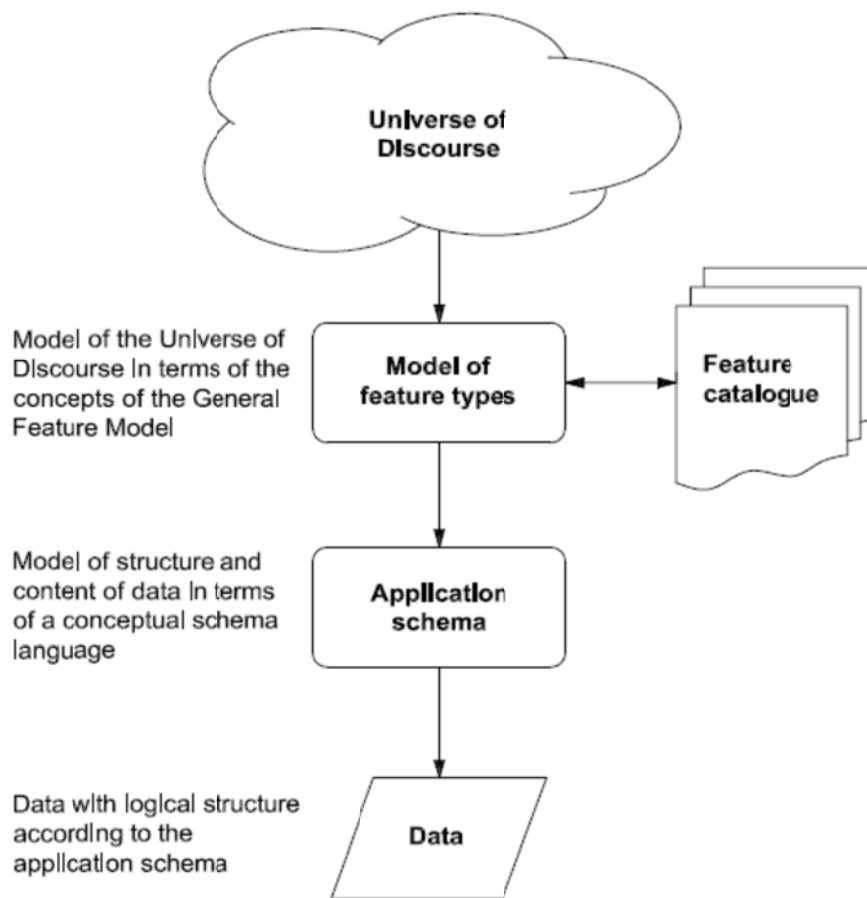
Figure 12   From reality to geographic data

Figure 12 shows how a defined view of the world in a given context or "universe of discourse" is used as the basis for modelling features. These features can be represented in a conceptual schema language such as UML as an application schema and can be stored in documents called feature catalogues. Data then conforms to the structure and content of the application schema and consequently as reflected in the feature catalogue.

The flow diagram in Fig 13 is based on S-100 Appendix A and shows the process for a geospatial product, which could include vector and coverage data. In effect this is a more detailed view of figure 12 showing the steps that the processes follow.

```
                          ┌──────────────────┐
                          │ Determine geometry│
                          │   requirement    │
                          └──────────────────┘
```

Determine geometry requirement

Vector or Coverage

Determine feature classes

Vector

Coverage

Determine geometry types

Definitions exist?

No

Yes

Determine attributes

Types exist?

No

Apply to TSMAD for Addition

Yes

Definitions exist?

No

Yes

Determine enumerants

Create application schema

Content and structure of coverage

Definitions exist?

No

Yes

Create Feature Catalogue

Coordinate Reference System

Bind features and attributes

Build Portrayal Catalogue

Product Specification Documentation

Register definitions in the GI Registry See section 6

Feature Catalogue

Portrayal Catalogue

Defines content

Defines display
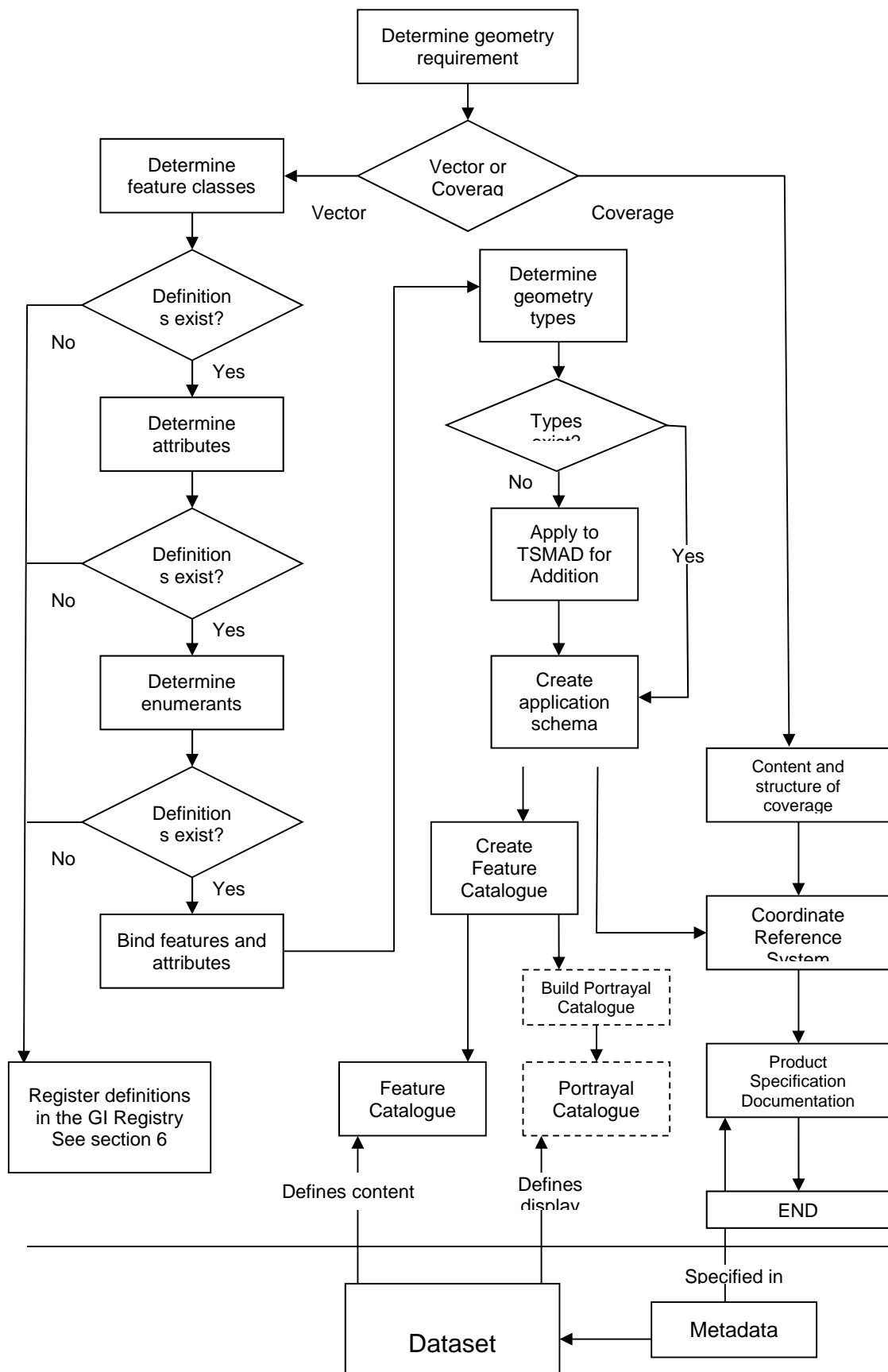
END

Specified in

Dataset

Metadata

Figure 13   Product specification process

Page 32 of 57

7.1.1   Key Steps

The following are key steps when developing S-100 based product specifications:

7.1.1.1   Determine geometry requirement

The first step in developing the specification is to determine whether the data will be discrete or continuous (vector geometry or coverage-based see 5.1.1). A product specification may include both discrete and continuous data and these can be scoped separately.

- Vector Geometry or Coverage-based

    Geographic phenomena fall into two broad categories — discrete and continuous. Discrete phenomena are recognizable objects that have relatively well-defined boundaries or spatial extent. Examples could include buildings, or aids to navigation. Continuous phenomena vary over space and have no specific extent. Examples could include radio signal strength or ground elevation. A value or description of a continuous phenomenon is only meaningful at a particular position in space (and possibly time). Signal strength, for example, takes on specific values only at defined locations, whether measured or interpolated from other locations.

7.1.1.2   Determine classes and attributes

The next step is to identify groups or classes into which the data objects fall and their associated properties or attributes. The data objects, classes and attributes may have already been defined for another application and those existing definitions should be used. If not, then new definitions will need to be created. S-100 uses two specific object types, the feature type for objects that have attributes and geometric properties and the information type which is an object with no geometric properties. Information types can be associated with feature types.

EXAMPLE: Aids to Navigation are discrete phenomena, which can be divided into the classes: fixed and floating. As they carry a position these would be feature types in S-100. Their properties would be defined as attributes, such as shape, colour and name.

An AtoN Report could be an information type carrying details of the report, date and the author.

Note: Attributes other than geometric properties are considered thematic attributes these can be simple or complex. A simple attribute carries a descriptive characteristic usually a value of a given type e.g. text, date, Boolean, integer. A complex attribute is a property composed of one or more simple attributes known as sub attributes.

7.1.1.3   Create application schema

The next step is to create a model (schema) of the application. This can either be a logical model or a physical model.

EXAMPLE: A logical (conceptual) model can be created in Unified Modeling Language (UML). A physical (encoded) model can be created in Extensible Markup Language (XML).
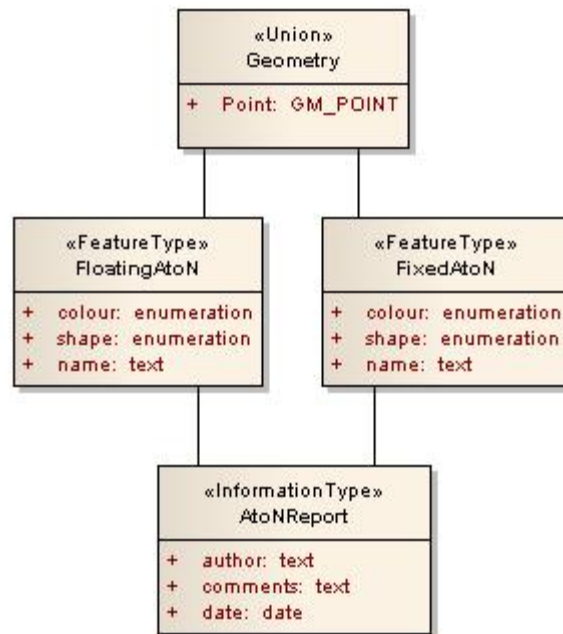
Figure 14   Example model in UML

If the application involves complex structures or relationships, these can more easily be visualized in UML and the resulting logical model should be included in the Product Specification. In some cases it is possible to generate the physical model automatically from the logical model.

In the S-100 application, schemas are realized in a Feature Catalogue that is encoded in XML. This defines the features, information types and attributes used within a data product.

7.1.1.4   Coordinate Reference System

The appropriate Coordinate Reference System (CRS) must be determined for the data product. It could be horizontal and vertical coordinate reference systems,

EXAMPLE

WGS84 (World Geodetic System of 1984) should be used for the horizontal reference system for spatial data. WGS84 should be used as the reference ellipsoid. The data producer must undertake any conversion.

7.1.1.5   Units of measure

Measurement units need to be specified.

EXAMPLE: meters, nautical miles

7.1.1.6   Data Quality

Accuracy of data and validation procedures should be indicated.

EXAMPLE: +/- 1 m (95% probability) measured against a given reference system.

7.1.1.7   Maintenance

The ownership of the specification and the revision arrangements should be shown.

EXAMPLE: IALA Committee XYZ is responsible for revising this Product Specification annually.

7.1.1.8   Portrayal

Portrayal is optional in S-100, but if included, provides the rules for display and symbology, which apply to the data defined in this specification and should be described in a Portrayal Catalogue.

EXAMPLE: Display and symbols should be in accordance with IMO SN Circ. 243.

7.1.1.9   Data format (encoding)

Encoding needs to be discussed, options include XML and GML (Geography Markup Language).

For some products a web service such as an OGC Web Feature Service (WFS) may replace traditional encoding formats.

The following example (Figure 15) shows an XML encoding for buoys, taken from a model produced by the General Lighthouse Authorities, put in a form of XML being developed by the UK Hydrographic Office for S-100 Product Specifications.

```xml
<?xml version="1.0" encoding="utf-8" ?>
<s100:FeatureCollection xmlns:s100="http://www.iho.int/S-100"
xmlns:a104="http://www.iala-aism.org/A-104"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="http://www.iala-
aism.org/A-104 A-104XMLSchema.xsd">
   <s100:featureMember>
    <a104:BuoySpecialPurposeGeneral s100:id="F1">
      <a104:featureName>AFAN OUTFALL INNER</a104:featureName>
      <a104:buoyShape>spherical</a104:buoyShape>
      <a104:categoryOfSpecialPurposeMark>pipeline
mark</a104:categoryOfSpecialPurposeMark>
      <a104:colour>yellow</a104:colour>
      <a104:depth>8.1</a104:depth>
      <a104:topmark>
                <a104:topmarkShape>x-shape (St. Andrew's
cross)</a104:topmarkShape>
                <a104:topmarkColour>yellow</a104:topmarkColour>
      </a104:topmark>
      <s100:Point><s100:pos>-3.90093 51.58994</s100:pos></s100:Point>
    </a104:BuoySpecialPurposeGeneral>
  </s100:featureMember>
  <s100:featureMember>
    <a104:Lights s100:id="F2">
      <a104:signalPeriod>10</a104:signalPeriod>
      <a104:signalGroup>(1)</a104:signalGroup>
      <a104:colour>yellow</a104:colour>
      <a104:lightCharacteristic>flashing</a104:lightCharacteristic>
      <a104:lightDescription>Fl.Y.10s</a104:lightDescription>
      <s100:Point><s100:pos>-3.90093 51.58994</s100:pos></s100:Point>
    </a104:Lights>
  </s100:featureMember>
</s100:FeatureCollection>
```

Figure 15   Example of XML Schema for Buoys (GLA/UKHO)

7.2   Example 2

Development process of product Specification and consideration for AtoN management data.

7.2.1   Steps followed

7.2.1.1   Determine the target domain

- determine the target domain for developing Product Specification e.g.) AtoN, VTS, IVEF, etc.;

- if there is not the target domain in the GI registry, propose a new domain. (to the Hydrographic Services and Standards Committee (HSSC) [S-99]).

7.2.1.2   Determine geometry requirement

- determine whether the scope will be feature based (i.e. use vector geometry) or coverage-based. [S-100 Part 11];

- according to the specification scope, development process of the product specification will be different. [S-100 Part 11];

- AtoN management data is feature based data.

7.2.1.3   Register Definitions in appropriate FCD Register

Determine features, feature attributes, enumerated values in the product e.g. features and feature attributes related to AtoN.

Navguide2010			
Level1	**Level2**	**Level3**	**Comments**
AtoN			visual AtoN
	FixedAtoN		
		LightHouse	staffed facility/automated facility
		Beacon	
		Sector Light	
		Leading Line	pair of beacons
	FloatingAtoN		
		Buoy	minor floating aton
		LightVessel	major floating aton
		LightFloat	major floating aton
		LANBY	major floating aton large navigational buoy
	Racon		supplementary AtoN
	Light		supplementary AtoN
	DGPS		supplementary AtoN
	AtoNAIS		supplementary AtoN
	SoundSignal		supplementary AtoN

Figure 16   AtoN items in the IALA NAVGUIDE 2010

lateral mark	
	port hand mark
	starboard hand mark
	preffered channel to starboard
	preffered channel to port
cardinal mark	
	north
	east
	south
	west
isolated danger mark	
safe water mark	
special mark	
new danger mark	

Figure 17   Mark types in the IALA NAVGUIDE2010

name	Text
id	Text
code	Text
number	Integer
colour	Colour
colourpattern	ColourPattern
shape	Text
establishedDate	Date
surveyedDate	Date
daymark	Mark
position	Point
includelight	Light
includeAIS	AtoNAIS
includeRacon	Racon
includeDGPS	DGPS
includeSiren	SoundSignal

Figure 18   Attributes for AtoN items (Derived from the IALA NAVGUIDE2010)

- If required definition is already in the existing FCD register, select the item;

- If required definitions do not exist in the existing FCD registers, register definitions in the most appropriate feature concept dictionary. S-99 is then applicable.

Sector light : A light having sectors of different colors or the same color in specific sectors separated by dark sectors
Light sector : As defined by bearings from seaward, the sector in which a navigational light is visible or in which it has a distinctive color difference from that of adjoining sectors, or in which it is obscured
Lighthouse : A distinctive structure exhibiting a major navigation light
Leading line : On a nautical chart, a straight line, drawn through leading marks. A ship moving along such line will clear certain dangers or remain in the best channel.

Figure 19   Examples of Aton items

- Feature Concept : AtoN, Light, Buoy, Mark, Beacon,,,,

- Attribute Concept : name, id, height, colour, shape, established_date, iala_region,,,,

- Enumerated value concept :

Example) red, blue, orange, black, white,,, (enumerated_values for the attribute 'colour')

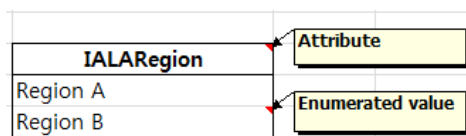Example) region_A, region_B (for iala_region)

Figure 20   Regions

7.2.1.4   Create Feature Catalogue

- Registered items in a feature concept dictionary are independent sets of definitions of features, attributes, enumerated values, and information types;

- Registered items drawn from one or more feature concept dictionaries are bound to describe characteristics of features in the AtoN domain;

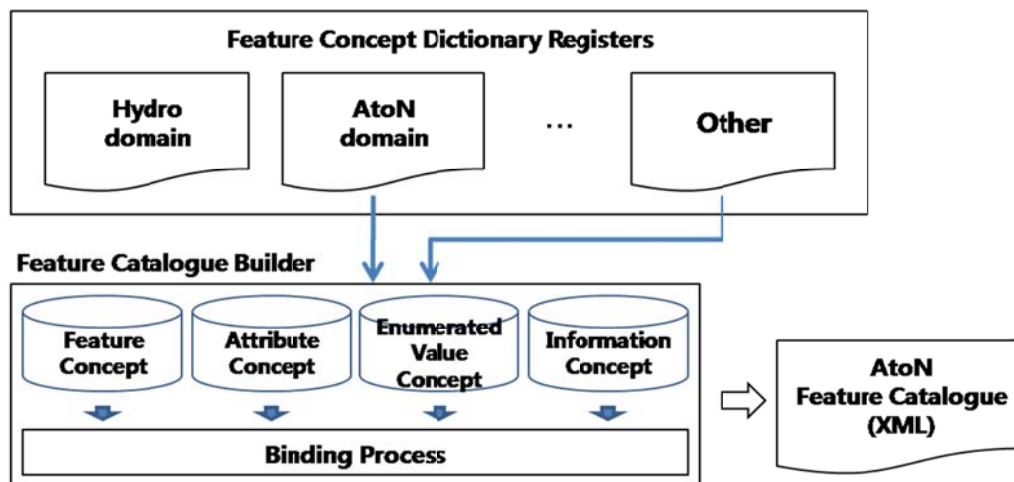- In a feature catalogue, item types, for example, features and attributes, are bound together.

Figure 21   Concept diagram of feature catalogue builder

- In addition, constraints, units of measurement and format descriptions of attributes can be specified. [S-100 Part 2a]

- Feature concept, attributes concepts, and enumerated value concepts are bound together and described in the AtoN feature catalogue in XML.
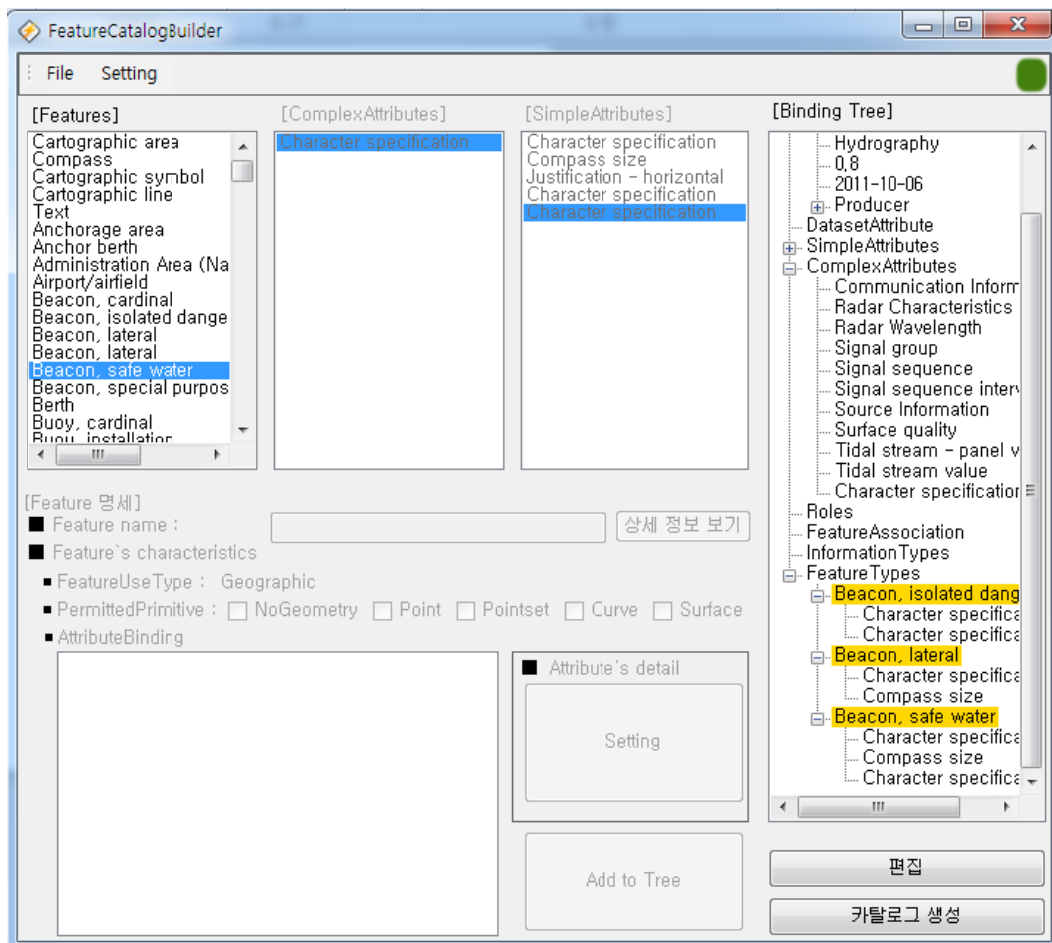

Figure 22   Examples of Feature Catalogue Builder (developed by Dongseo Univ)

A feature catalogue builder is a program that supports generation of a feature catalogue in XML.

7.2.1.5   Create Portrayal Catalogue

- Create a portrayal catalogue that specifies symbology and presentation guideline of features in the feature catalogue.

- A Portrayal Catalogue Builder will support creation of a portrayal catalogue.

7.2.1.6   Profile metadata model

- Profile metadata model for describing AtoN data set.

7.2.1.7   Determine encoding format and delivery

- Determine encoding format and delivery of AtoN data set.

7.2.1.8   Product Specification

- Based on all previous steps the information is complete and the template can be filled in. When the template is complete the product specification is finished and can be submitted.

8   IALA PRODUCT SPECIFICATION PROCESS

In the previous chapters information was provided about the S-100 GI-Registry and how this will foster the e-Navigation concept. Furthermore an introduction was given regarding the development of product specifications. For the development of product specification within the IALA domain a flowchart was developed. The flowchart, as seen in figure 23 on the next page, together with the product specification template can be used as a reference in the development of future product specifications.
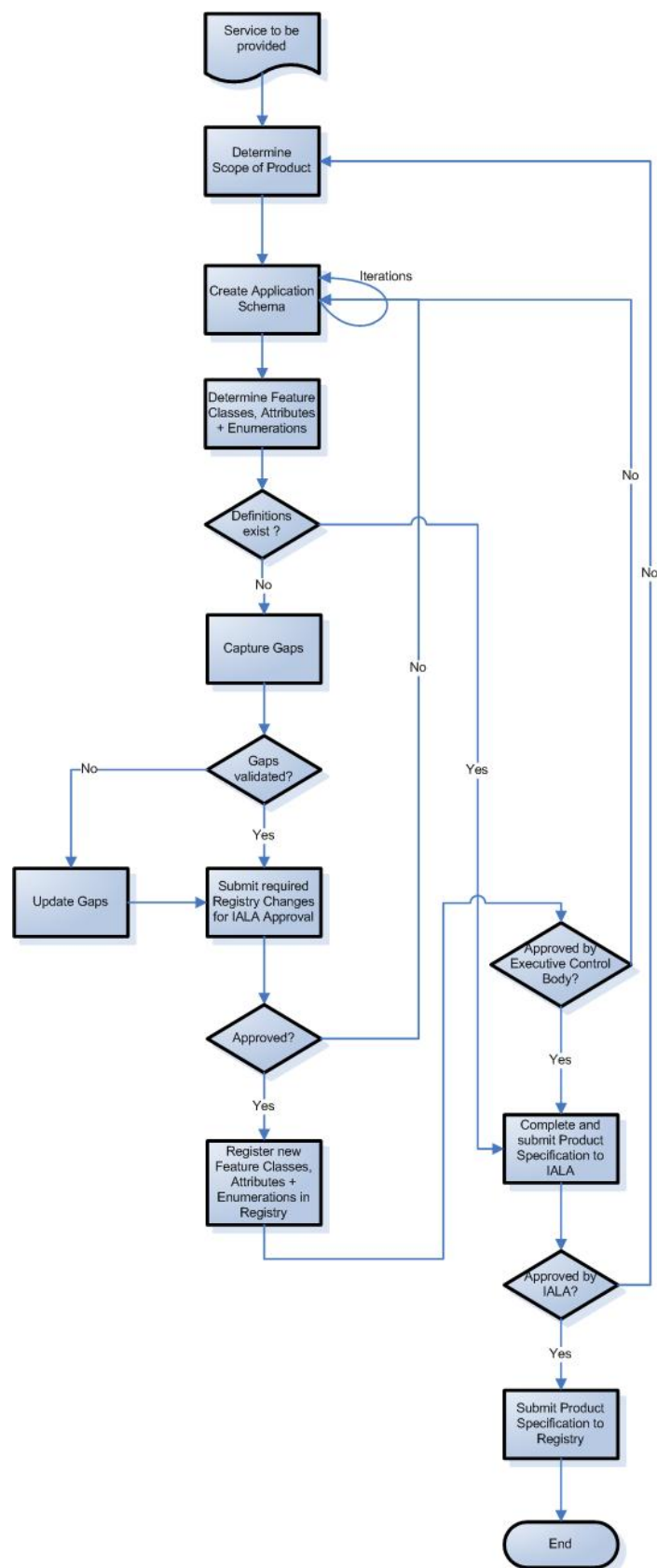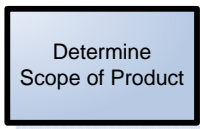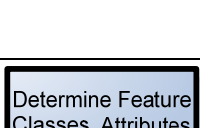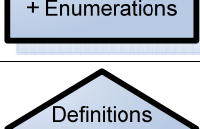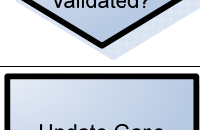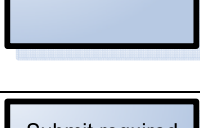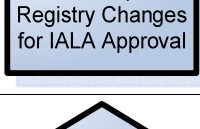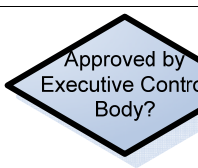
Figure 23   IALA Product Specification Process

Since a flowchart cannot contain the full context of the steps in the process, the steps of the process as seen in figure 23 are briefly explained in Table 2.

Table 2   Elaboration on product specification process flow chart

Service to be provided	The entry point assumes there has been the necessary discussion within the IALA organization, which has endorsed the action to create an S-100 product specification. This action includes setting up the task group that will develop the product specification.
Determine Scope of Product	The task group refines the scope into the product specification, utilizing the Product Specification Template. Procedures, item types etc. are a part of the scoping. What is the product supposed to do, is it for regional use or global use etc.
Create Application Schema	The task group develops the application schema using all required feature classes, attributes and enumerations. This process can lead to a revised list of needed feature classes, attributes and enumerations. Typically the development process includes a number of iterations as the group refines the application schema. The outcome is a consensus S-100 compliant application schema.
Determine Feature Classes, Attributes + Enumerations	The task group makes an initial determination of the needed feature classes, attributes and enumerations. This process includes investigation of related domains for existing definitions and models that can be used for guidance.
Definitions exist ?	The task group checks for definitions of needed feature classes, attributes and enumerations in the GI registry. If all definitions exist then the product specification can be finished and submitted.
Capture Gaps	Any gaps (missing/inadequate definitions) discovered in the search for definitions are captured for later reference.
Gaps validated?	The previously identified gaps (missing/inadequate definitions) are validated against the consensus application schema as there may be revisions introduced during the iteration process.
Update Gaps	If the previously identified gaps (missing/inadequate definitions) require revision (due to added gaps, eliminated gaps, changed gaps, etc) these are captured for submission to the GI registry. For the submission of changes or creation of new item types a form is available, see Appendix 2.
Submit required Registry Changes for IALA Approval	Identified gaps are submitted to IALA Domain Control Body for approval of submission to the registry using the required form.
Approved?	If submission is approved, the new definitions can be registered as proposals on the GI registry, otherwise the submission is sent back to the task group for further revisions.

Register new Feature Classes, Attributes + Enumerations in Registry	Registering the new proposals is done by the IALA Domain Control Body or by someone designated to do this task.
Approved by Executive Control Body?	The submitted proposals will be reviewed by the GI Registry register managers and possibly the Executive Control Body for validity. If rejected, the proposal is sent back to the task group for revision.
Submit Product Specification to IALA	With all needed definitions registered in the GI Registry, the product specification can be completed and submitted to IALA for review and approval.
Approved by IALA?	During the review and approval process as described in chapter 3, IALA can determine if the draft product specification needs further improvements or decide it is completed. If further improvements are needed, the draft product specification is sent back to the task group.
Submit Product Specification to Registry	Once complete, the task group can be requested by IALA to submit the finished product specification to the Product Specification Register manager.
End	All done.

APPENDIX 1   **Product Specification template**

IALA …….
Product Specification

Draft 0.0.1 – month year

IALA ASM Product Specification

Document Revisions

Revisions to the IALA Document are to be noted in the table prior to the issue of a revised document.

Date	Page / Section Revised	Requirement for Revision

1   OVERVIEW

Introduction

<Provide a general introduction regarding the intent and use of this product specification

References

1.1.1   Normative references

IHO S.100 IHO Universal Hydrographic Data Model, January 2010

1.1.2   Informative references

Terms, definitions and abbreviations

1.1.3   Terms and Definitions

The following terms and definitions are in addition to those in S-100 Annex A.
<Insert Terms and Definitions>

1.1.4   Abbreviations

<Insert Abbreviations>

IALA-AISM	International Association of marine aids to navigation and Lighthouse Authorities
CRS	Coordinate Reference System
ECDIS	Electronic Chart Display Information System
EPSG	European Petroleum Survey Group
ENC	Electronic Navigational Chart
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardization

Product specification metadata

<This information uniquely identifies this Product Specification and provides information about its creation and maintenance.>

Title: <title of the product specification>

   X-### Version: 0.0.0   <version of the product specification following 1.1.5.5>

Identifier: <X-### unique IALA identifier>

S-100 Version: 1.0.0   <version of S-100 used in the creation of this product specification>

Date: <date of the creation or last update of this product specification>

Language: <language(s) of the product specification, English is mandatory, other languages may be included>

Classification: **001 - unclassified**

Contact: IALA-AISM
10, rue des Gaudines
78100 Saint Germain en Laye, France
Telephone: +33 1 34 51 70 01   Fax: +33 1 34 51 82 05
URL: http://registry.iho.int/s100_gi_registry/ProductSpecificationRegister/ps_home.php

Maintenance:
-    Who maintains the product specification

- Specified review regime
- Specified procedures

1.1.5   IALA Product Specification Maintenance

This chapter is for clarification only on PS Maintenance.

1.1.5.1   Introduction

Changes to a product specification will be released by IALA-AISM as a new edition, revision, or clarification.

1.1.5.2   New Edition

New editions of a product specification introduce significant changes. *New editions* enable new concepts, such as the ability to support new functions or applications, or the introduction of new constructs or data types.

1.1.5.3   Revisions

Revisions are defined as substantive semantic changes to a product specification. Typically, revisions will change a product specification to correct factual errors; introduce necessary changes that have become evident as a result of practical experience or changing circumstances. A *revision* must not be classified as a clarification. *Revisions* could have an impact on either existing users or future users of a product specification. All cumulative *clarifications* must be included with the release of approved corrections.

Changes in a revision are minor and ensure backward compatibility with the previous versions within the same edition. Newer revisions, for example, introduce new features and attributes. Within the same edition, a data product of one version could always be processed with a later version of the feature and portrayal catalogues.

1.1.5.4   Clarification

Clarifications are non-substantive changes to a product specification. Typically, clarifications: remove ambiguity; correct grammatical and spelling errors; amend or update cross references; insert improved graphics, spelling, punctuation and grammar. A clarification must not cause any substantive semantic change to a product specification.

Changes in a clarification are minor and ensure backward compatibility with the previous versions within the same edition. Within the same edition, a data product of one clarification version could always be processed with a later version of the feature and portrayal catalogues, and a portrayal catalogue can always rely on earlier versions of the feature catalogues.

1.1.5.5   Version Numbers

The associated version control numbering to identify changes (n) to a product specification must be as follows:

New editions denoted as n.0.0

Revisions denoted as n.n.0

Clarifications denoted as n.n.n

2   SPECIFICATION SCOPES

< Some parts of a product specification may apply to the whole product whereas other parts of the product specification may apply to parts of the product. Coordinate reference system will generally apply to the complete product; whereas maintenance regimes may be different for navigational features and contextual features. If a specification is homogeneous across the whole data product

it is only necessary to define a general scope (e.g. root scope), to which each section of the data product specification applies. >

Scope identification	According to S-100 table 11-3
Level	According to S-100 table 11-3
Level name	According to S-100 table 11-3

3 DATA PRODUCT IDENTIFICATION

<Information that uniquely identifies each data product>

Title: <data product title>

Alternate Title: <optional alternate data product title>

Abstract: <Brief narrative summary of the content of the data product>

Topic Category: <optional field using MD_TopicCategoryCode (ISO 19115) to capture theme information about the data product content>

Geographic Description: <value from a code list of described regions. The code list can be defined by an international body or the producer of the data>

Spatial Extent: For IALA products probably "Global" will be default.

Description:

East Bounding Longitude: -180
West Bounding Longitude: 180
North Bounding Latitude: 90
South Bounding Latitude: -90

Spatial Resolution: <level of detail expressed as a scale factor or a ground distance>

Purpose: <Summary of the intention with which the data product is developed>

Language: <Language(s) of the data product using the format of ISO 639-2. One value must be English. If language is not applicable, e.g. for gridded data, use "not applicable" as value for the element>

Spatial Representation Type: <Form of the spatial representation, S-100 allows one of the following two options>

001	vector
002	grid

Default setting for IALA Product Specifications would be vector.

Point of Contact: <Identification of, and means of communication with, the responsible entity(ies) issuing the data. Field must use the structure of CI_ResponsibleParty (ISO 19115).>

Use Limitation: < Limitation affecting the fitness for use of the data product. Field is a character string>   Applicable if Product Specification is dependent on other PS or specific software or device.

4   DATA CONTENT AND STRUCTURE

Introduction

<This clause mandates different requirements for compliant data products. There are different requirements for feature based data versus coverage based data.
This template focuses only on feature based data; for coverage based data see S-100 part 7.>

Application Schema

<This section holds the application schema, which describes the concepts of the data model of the product specification. The application schema shall be described using the S-100 conceptual schema language. At least one UML diagram (or more) needs to be provided. Normally, the full application schema is described in this section, however, for specifications that have large application schemas a subset showing the main concepts of the model can be provided.>

Feature Catalogue <Build Feature Catalogue by using Feature Catalogue Builder>

Introduction:

Name:

Scope:

Field of application:

Version Number:

Producer:

Functional Language:

4.1.1.1   Complex attributes

Complex attributes are a composition of other attributes; either simple or complex.

Data Product Types

<This paragraph is optional>
<By the use of scopes, there may be different types of data products within a product specification. The nature of these types is described here with particular specifications that apply specifically to the types.>

Data Product Loading and Unloading

<This paragraph is optional>
<This section provides guidance on how data products are loaded and/or unloaded in a typical use scenario. This section may also be used to describe any dependencies that may exist on other data products, such as ENC>

Geometry

<Geometric representation is the digital description of the spatial component of an object as described in S-100 and ISO 19107. Specify, in accordance with S-100 part 7 paragraph 5.3, which S-100 Level of Geometry is to be used in the product specification and any deviations from these. >

5   CO-ORDINATE REFERENCE SYSTEMS (CRS)

Introduction

<This clause specifies the type of Coordinate Reference System used in the data product.>

WGS-84 is the default

6   DATA QUALITY

< Each product specification shall describe the data quality requirements. The "data quality overview element" allows users to decide whether this dataset is the one they want. The data quality overview element should include at least the intended purpose and statement of quality or lineage.   Other data quality elements cover: completeness, logical consistency, positional uncertainty, temporal uncertainty, thematic uncertainty, and anything data quality related that is specifically required for the data product being specified.>
<Additional guidance for data quality can be found in IMO e-Navigation Software Quality Assurance guideline>

7   DATA CAPTURE AND CLASSIFICATION

<This paragraph is optional.>

<This section contains guidance about how the data is to be captured. This should be as detailed and specific as necessary. Should this guidance become extensive, then it can be placed in an annex, and referenced from this section.>

For example, data sources, time validity and data production process could be described, depending on desired classification of the data product.

8   DATA MAINTENANCE

<This section specifies how data product maintenance is done, how frequent and how it is done>

<Additional guidance for data maintenance can be found in IMO e-Navigation Software Quality Assurance guideline>

For message-type or streaming based data distribution this section may not be relevant.

Maintenance and Update Frequency:

Data Source:

Production Process:

9   PORTRAYAL

<This paragraph is optional.>

<This section contains the portrayal catalogue or a reference to where it is found. In an S-100 1.0.0 based product specification, the portrayal catalogue is optional. S-100 1.0.0 has no complete portrayal part. If it is considered that portrayal of the data product specified by the product specification is significant enough to specify, a portrayal standard (such as OGC Styled Layer Description) may be used.>

Item Name	Description	M/O	Card	type
portrayalLibraryCitation	Bibliographic reference to the portrayal library	O	0..1	CI_Citation (ISO 19115)

10   DATA PRODUCT FORMAT (ENCODING)

Introduction

<This clause specifies the encoding for conformant data products. While various encodings may be used such as GML and XML, if the primary intent is that this data will be used in conjunction with ENCs on an ECDIS, then IHO recommends that ISO/IEC 8211 encoding should be used. Should another encoding be used by the product specification, this encoding must be sufficiently specified within the product specification itself, or a reference to the encoding standard must be provided. If the encoding is in the form of AIS Application Specific Messages, the standard table form can be used where attributes are mapped to a number of bits in the bit sequence.>

Format Name:

Version:

Character Set:

Specification:

11   DATA PRODUCT DELIVERY

<This paragraph is optional.>
<This clause specifies the delivery mechanisms for compliant data products. The clause can also include specifications on units of delivery; transfer size, medium name and other relevant delivery information. If a data product can be delivered in several formats, then the appropriate information for each shall be given. If the delivery mechanisms are in the form of information services, the used service standard and service interface definition should be sufficiently specified or referenced.>

Dataset

<if the data products are datasets, further specifications can be provided here. Else this section can be removed.>

11.1.1   Datasets

<Specify the distribution format:

- *Message based*
- *Streaming based*
- *Datasets*

In case of datasets, specify the distribution format to be one or more of the following: new edition, update or re-issue.>

11.1.2   Dataset size

<Specify any limitations on dataset size or, in case of message-based distribution, message size>

11.1.3   Dataset file naming

<Specify the dataset naming convention>

Support Files

<Specify if the product will utilize support files>

11.1.4   Support File Naming

<If applicable specify the naming convention for support files>

Exchange Catalogue

<This paragraph is optional.>

<An exchange set is a grouping of data sets in a logical, consistent and self-contained collection to support the interchange of geospatial data and meta data. It is comprised of at least one dataset (i.e a collection of features) and one exchange catalogue. This is the minimum number of entities that can be encapsulated in an exchange set. An exchange set may also contain a number of support files.>

<Specify if the data delivery will include an exchange catalogue and if so, what the structure of the exchange catalogue is>

12   METADATA

<This clause specifies the metadata for the data product. It may be in an XML format and will conform to Part 4 S-100 metadata.>

<Dataset metadata is intended to describe information about a dataset or data resource. It facilitates the management and exploitation of data and is needed for understanding the characteristics of a dataset>

<Select all core S-100 metadata elements that are of interest plus any additional ones from the base ISO 19115 metadata elements. Document the metadata elements in a tabular list as in the example provided below >

<It is recommended to create a sample XML file to match the tabular list and to validate it. For this purpose the base XML schema for ISO 19114 can be used, as described in ISO 19139. The base XML schema can be found at: http://www.isotc211.org/2005/ *as is outlined here:* http://www.isotc211.org/schemas/2005/ *>*

<For these cases in which the S100/ISO19115 defined metadata elements are not sufficient to accommodate some more specific metadata requirements, such cases need to be handled by a custom extension, as is outlined in ISO 19139, section A.3 Conformance requirements - Extensions. >

<An example of metadata for an Ice Information Product Specification is provided on the next page
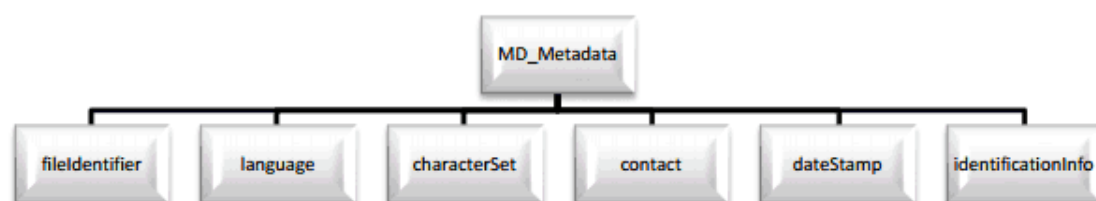
Element Name	Description	Namespace
MD_Metadata	root element	gmd
fileIdentifier	Id for dataset	gmd
language	Product language	gmd
characterSet	Used characterset	gmd
contact	Contact data	gmd
dateStamp	date of publishing	gmd
identificationInfo	Specific info about product	gmd

```xml
<?xml version="1.0" encoding="UTF-8"?>
<gmd:MD_Metadata  xmlns:gmd="http://www.isotc211.org/2005/gmd"
                  xmlns:gco="http://www.isotc211.org/2005/gco"
                  xmlns:gml="http://www.opengis.net/gml/3.2">
      <gmd:fileIdentifier> ... </gmd:fileIdentifier>
      <gmd:language> ... </gmd:language>
      <gmd:characterSet> ... </gmd:characterSet>
      <gmd:contact> ... </gmd:contact>
      <gmd:dateStamp> ... </gmd:dateStamp>
      <gmd:identificationInfo> ... </gmd:identificationInfo>
</gmd:MD_Metadata>
```

>

ANNEX A   DATA CLASSIFICATION AND ENCODING GUIDE

<This annex contains the template for a data classification and encoding guide that can be used or referenced in clause 7>

<u>IHO Definition:</u> **FEATURE:** Definition. (Source of definition).

<u>**S-101 Geo Feature:**</u> **Feature (S-57 Acronym)** S-101 feature and corresponding S-57 acronym

<u>Primitives:</u> **Point, Curve, Surface Allowable geometric primitive(s)**   *<This clause specifies the discovery metadata for the data product. It is usually in an XML format and conforms to S-100 metadata.>*

Real World	*Paper Chart Symbol*	*ECDIS Symbol*
Example if real world instance(s) of the Feature.	Example(s) of paper chart equivalent symbology for the Feature.	Example(s) of ECDIS symbology for the Feature.

S-101 Attribute	S-57 Acronym	Allowable Encoding Value *	Type	Multiplicity
Category of beer		1 : ale 2 : lager 3 : porter 4 : stout 5 : pilsener	EN	1,1
This section lists the full list of allowable attributes for the S-101 feature. Attributes are listed in alphabetical order. Sub-attributes (Type prefix (S)) of complex (Type C) attributes are listed in alphabetical order and indented directly under the entry for the complex attribute (see below for example).	This section lists the corresponding S-57 attribute acronym. A blank cell indicates no corresponding S-57 acronym.	This section lists the allowable encoding values for S-101 (for enumerate (E) Type attributes only). Further information about the attribute is available in Section XX.	Attribute type (see clause X.X).	Multiplicity describes the "cardinality" of the attribute in regard to the feature. See clause X.X.
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1

<u>INT 1 Reference:</u> The INT 1 location(s) of the Feature – by INT1 Section and Section Number.

X.X.X Sub-clause heading(s) (see S-4 – B-YYY.Y)

Introductory remarks. Includes information regarding the real world entity/situation requiring the encoding of the Feature in the ENC, and where required nautical cartographic principles relevant to the Feature to aid the compiler in determining encoding requirements.

Specific instructions to encode the feature.

<u>Remarks:</u>
- Additional encoding guidance relevant to the feature.

X.X.X.X Sub-sub-clause heading(s) (see S-4 – B-CCC.C)

Clauses related to specific encoding scenarios for the Feature. (Not required for all Features).

<u>Remarks:</u>
- Additional encoding guidance relevant to the scenario (only if required).

<u>Distinction:</u> List of features in the Product Specification distinct from the Feature.

ANNEX B   DATA PRODUCT FORMAT (ENCODING)

<This annex can be used to provide specification on the encoding of compliant data products>

ANNEX C   NORMATIVE IMPLEMENTATION GUIDANCE

<This annex can be used to provide specific guidance that must be adhered to during implementation of systems that will utilise the data product specified by this product specification>

ANNEX D   FEATURE CATALOGUE

<This annex can be used to carry the feature catalogue>

ANNEX E   PORTRAYAL CATALOGUE

<This annex can be used to carry the optional portrayal catalogue>

APPENDIX 2   **Proposal template**

<u>Proposal of **Item** **Name** to the S-100 FCD</u>

Register:

Name:

Alphacode:

CamelCase:

(For complex attributes include sub attributes here e.g.)

Sub attribute	Cardinality		Infinity	Sequential
	Lower	Upper		

Definition:

Remarks:

Proposed Change:

Justification:

APPENDIX 3   **Appendix 3 Product Specification under Development template**

Introduction

<Provide a general introduction regarding the intent and use of the product specification>

Contact:
<Organisation(s)>
<Contact person(s)>

Date project start:
<dd-mm-yyyy>