IALA GUIDELINE

G1106
PRODUCING AN IALA S-200 SERIES PRODUCT SPECIFICATION

Edition 3.0

June 2025

urn:mrn:iala:pub:g1106:ed3.0

10, rue des Gaudines - 78100 Saint Germain en Laye, France
Tel. +33 (0)1 34 51 70 01 - contact@iala.int
www.iala.int
International Organization for Marine Aids to Navigation

DOCUMENT REVISION

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

Date	Details	Approval
December 2013	First issue.	Council 56
June 2017	Edition 2.0: Chapters 1, 2 and 3 Changes in procedures and approach. Removed Section 3 on domains management and amendments throughout the document.	Council 64
July 2022	Edition 2.1 Editorial corrections.	
June 2025	Edition 3.0 Revision to align with the latest version of IHO S-100 standard (edition 5.2.0 June 2024).	Council 02

CONTENTS

CONTENTS

List of Tables

List of Figures

1. INTRODUCTION

In January 2010, the International Hydrographic Organisation (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.

At its 57th session, the IMO NAV - now renamed as the NCSR - 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 Organisation, 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.

1.1. OBJECTIVES OF THE GUIDELINE

This Guideline is aimed to assist IALA members and/or other international organizations in the development of S-100 compliant product specification for the S-200 domain. Product specifications are needed for the development and implementation of a Maritime Service (MS) in the context of e-navigation. The MSs are described in IMO MSC.1/Circ. 1610/Rev.1 on initial descriptions of Maritime Services in the context of e-Navigation and will be further developed by the appointed standardization body.

IHO guideline S-97 "IHO Guidelines for Creating S-100 Product Specifications" is a comprehensive and frequently updated guideline. With regards to product specification development IALA refers to the IHO S-97 as the primary document. This guideline is intended to give guidance on specific S-200 domain subjects that are not covered within the S-97 guideline. These subjects are included in the S-200 product specification template.

1.2. THE IHO S-100 UNIVERSAL HYDROGRAPHIC DATA MODEL

S-100 – IHO Universal Hydrographic Data Model comprises a set of related parts that give the user the appropriate tools and framework to develop and maintain hydrographic related data, products and registers. These standards specify, for hydrographic 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 hydrographic standards users will be able to build constituent parts of an S-100 compliant product specification. S-100 conforms as far as is reasonably possible to the ISO TC 211 series of geographical information standards, and where necessary has been tailored to suit hydrographic requirements. S-100 details the standard to be used for the exchange of hydrographic and related geospatial data between national hydrographic offices as well as between other organizations and for its distribution to manufactures, mariners and other data users.

To facilitate maximum operability and uniformity IALA has decided to adopt S-100 as the standard for the development for product specification needed to facilitate the Maritime Service in the context of e-Navigation. The

S-100 backbone is the Geospatial Information Registry. This contains a collection of harmonized information divided into a series of registers. These registers are subdivided into different domains. IALA is the domain owner for the S-200 domain.

1.3. IALA DOMAIN AND MANAGEMENT

IALA is a domain owner in the IHO GI registry. All product specifications developed by IALA are structured and managed by IALA.

In addition, IALA will need to cooperate and harmonize product specifications related to data used in VTS and AtoNs with other IHO GI registry owners, especially together with IHO and vice versa.

IALA has developed procedures to manage the IALA domain and its role as a Submitting Organisation to the IHO GI Registry. The IALA Domains management and submission process for an IALA S-200 series product specification is described in detail in IALA Guideline 1087.

1.4. IALA DOMAIN SPECIFIC REGISTRY INFORMATION

Some of the IHO S-100 parts will have to be interpreted in another context for use in the IALA domain.

Table 1 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, these management procedures will be part of the register. Procedures on amending existing product specifications.
Concept and Data Dictionary Registers	S-100 Part 2a	This part applies in full for the IALA Domain.
Portrayal register	S-100 Part 2b	IALA relevant portrayal information can be registered here.
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	This part applies in full for the IALA Domain.
Metadata for Imagery and Gridded Data	S-100 Part 4b	This part applies in full for the IALA Domain. .
Metadata – Data Quality	S-100 Part 4c	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	This part applies in full for the IALA Domain. A Feature Catalogue is defined for each Product Specification. Features and attributes are bound in a Feature Catalogue. The definitions of features and attributes are drawn from a Feature Data Dictionary. This Part defines the methodology for cataloguing feature types. It also specifies how the classification of feature types is organized into a Feature Catalogue and presented to the users of a set of geographic data. This Part is applicable to creating catalogues of feature types in previously un-catalogued domains and to revising existing Feature Catalogues to comply with standard practice. This Part applies to the cataloguing of feature types that are represented in digital form. Its principles can be extended to the cataloguing of other forms of geographic data. Part 5 is applicable to the definition of geographic features at the type of level. This international standard is not applicable to the representation of individual instances of each type.
Co-ordinate Reference Systems	S-100 Part 6	For IALA usage WGS84 (World Geodetic System of 1984) must be used for the horizontal reference system for spatial data.
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	This part applies in full for the IALA Domain.
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 training and enhanced usability. The portrayal catalogue is optional for IALA but can be applicable depending on the use case of the product.
Portrayal (Lua)	S-100 Part 9a	Implementation of portrayal using Lua scripting language. Probably not applicable for IALA product specifications.
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.
ISO/IEC 8211 Encoding Schema	S-100 Part 10a	Binary encoding schema. Probably not applicable for IALA product specifications.
GML Encoding	S-100 Part 10b	Geography Markup Language. Could apply for IALA product specifications.

Part Title	Part Number	Specific guidance for IALA use
HDF5 Encoding	S-100 Part 10c	Hierarchical Data Format. Could apply for IALA product specifications.
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 provision of maritime services.
S-100 Maintenance Procedures	S-100 Part 12	Specifically for maintenance of S-100 not applicable for IALA product specification development.
S-100 Scripting Language	S-100 Part 13	For description of script files written in Lua programming language. Probably not applicable for IALA product specifications.
Online Communication Exchange	S-100 Part 14	This part applies frequently to IALA PS's. As it describes the exchange of "streaming data" which is different from the data set exchange which was initially supported by S-100
Encryption and Data Protection	S-100 Part 15	Encryption and protection of data also applies to S-200 product specifications
Interoperability Catalogue Model	S-100 Part 16	Rules for interoperation between S-100 and S-200 data products could be applicable for IALA domain
Harmonized Portrayal of S-100 Products	S-100 Part 16a	Probably not applicable for IALA product specifications.
Discovery Metadata for Information Exchange Catalogues	S-100 Part 17	To support machine discovery of geographic data sets. Could apply to IALA product specifications.
Language Packs	S-100 Part 18	Methodology to provide multilingual support. Could apply to IALA product specifications.

1.5. DATA PRODUCT INTEROPERABILITY

In order to solve the problems of element redundancy, inconsistency, and duplication of icons that may occur when displaying different data products and radar information in the S-100 standard electronic chart or other shore-based application systems, S-100 defines a total of five levels of interoperability. When developing an S-200 product specification the requirements as stated in IHO S-98 should be taken into consideration.

1.6. MARITIME SERVICE DEVELOPMENT PROCESS

An agile approach is commonly used for the development of IT based services. In an Agile organization, business and IT work together on the development of the service. They interactively discuss information and user needs etc. and develop the software solution in an iterative way where the usability is frequently demonstrated to the end user. Information exchange between business and IT is conducted in an informal setting where teams work together

on a daily basis. This working arrangement can be challenging in the case of the development of e-Navigation MS since the information transfer regarding the MS is a pan committee and even a pan organization activity. Therefore, it is advised to follow a more structured way of working where a defined process is followed and information about an MS is well documented. The relationship between the different required documents is critical for the development process. The relationship between the documents and relation with other aspects in the development process is represented in Figure 1.

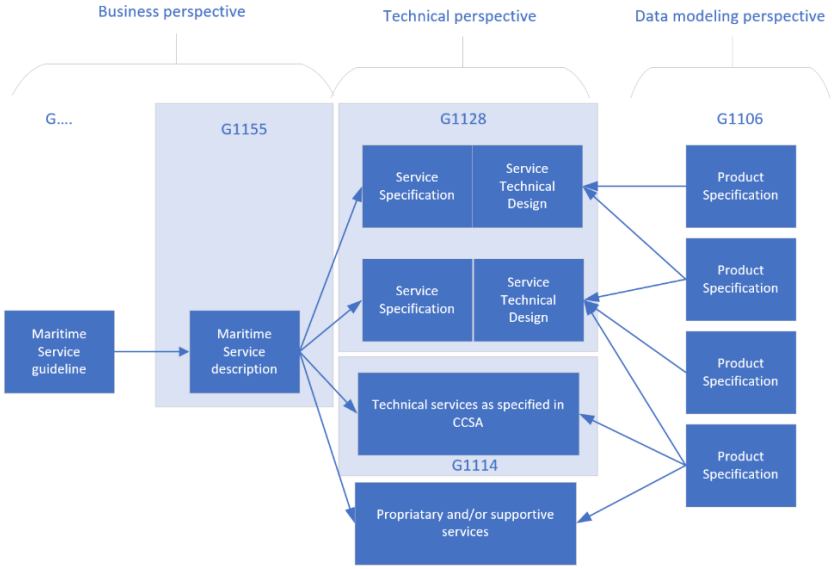


Figure 1 Relationship between Maritime Services, Maritime Service description, Technical Services and Product Specifications.

As depicted in figure 1 product specifications can be used for 1 or more technical services which together provide a maritime service in the context of e-Navigation. The Maritime service description gives information for the development of 1 or more technical services. These technical services use product specifications as building block for the technical services. If the required data product does not exist then it as has to be developed and document in a product specification. This is the task of the product specification developer.

As a part of the development process the developer is required to use registered concepts and related attributes. These can be found in the Concept Register and Data Dictionary register of the GI registry. If either the concept or the needed attributes do not exist a proposal can be made to add these to the GI registry. To register the new concepts and related attributes the IALA procedure as described in G1087 must be followed.

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.

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 required Maritime Service.

2. DEVELOPING A PRODUCT SPECIFICATION

2.1. INTRODUCTION

The purpose of this chapter is to describe the process that can be followed to create IALA Domain S-200 series product specifications based on the IHO S-100 standard part 11, IHO S-97and the implementation of the product specifications in the Geospatial Information registers.

2.2. PRODUCT SPECIFICATION

A product specification allows the standardisation of a data product according to the S-100 standard, in order to specify, implement and exchange a data product within the context of a Maritime Service (MS) in the context of e-Navigation. The MS for a given region consists of a collection of Operational Services, which are implemented as Technical Services. The services make use of 'data products' to exchange data. Examples of such IALA related data products are AtoN, Inter VTS Exchange Format (IVEF) service or AIS Application Specific messages.

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 (e.g., 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. Part 11 of the IHO S100 standard and S-97 describes in full the requirements for a product specification. It also provides a template for the development. S-100 Part 11 Appendix 11-D provides a template for the development of a product specification and the required information.

2.3. MAINTAINING AN IALA PRODUCT SPECIFICATION

Changes to a product specification will be released by IALA as a new edition, revision, or clarification. In the following chapters the different releases will be clarified.

2.3.1. NEW EDITION

New editions of this 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.

2.3.2. 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.

2.3.3. CLARIFICATION

Clarifications are non-substantive changes to this 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.

2.3.4. VERSION NUMBERS

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

- New editions denoted as n.0.0
- Revisions denoted as n.n.0
- Clarifications denoted as n.n.n

3. EXAMPLES OF THE PRODUCT SPECIFICATION PROCESS

In the next sections some examples are given on 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.

3.1. CONCEPTUAL VIEWPOINT

Figure 22, taken from ISO 19109, illustrates the process of converting a real situation into a geographic data model:

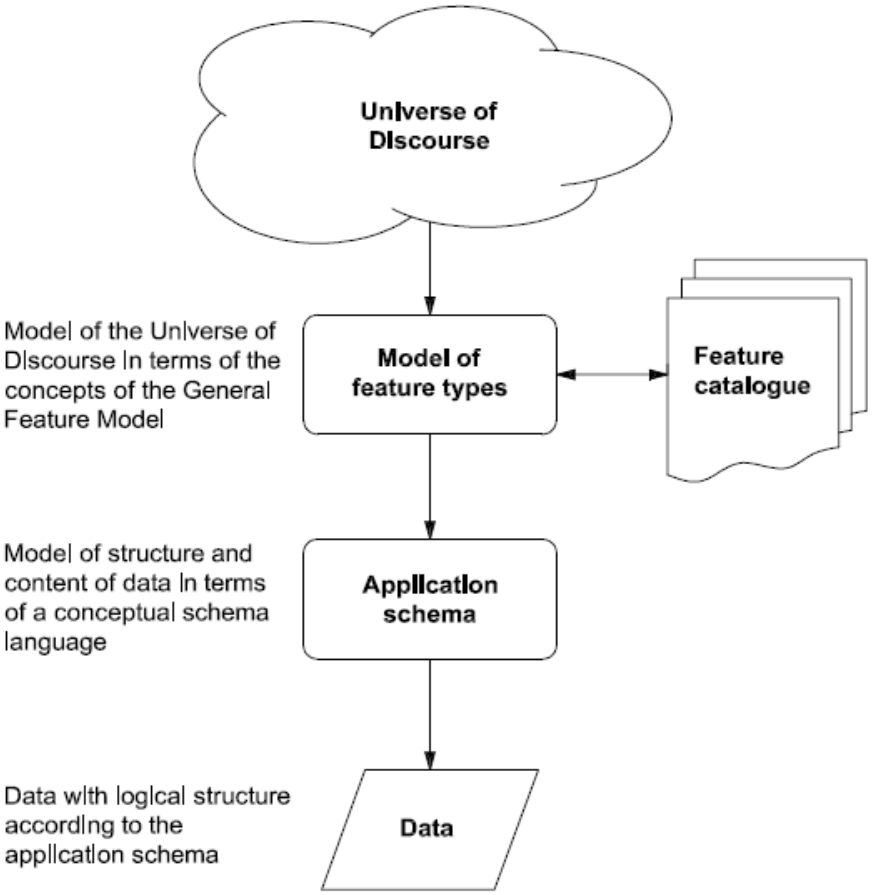


Figure 2 Process of converting a real situation into a geographic data model

Figure 2, 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 Figure 3 is based on S-100 Appendix 11 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 2 showing the steps that the process follows.

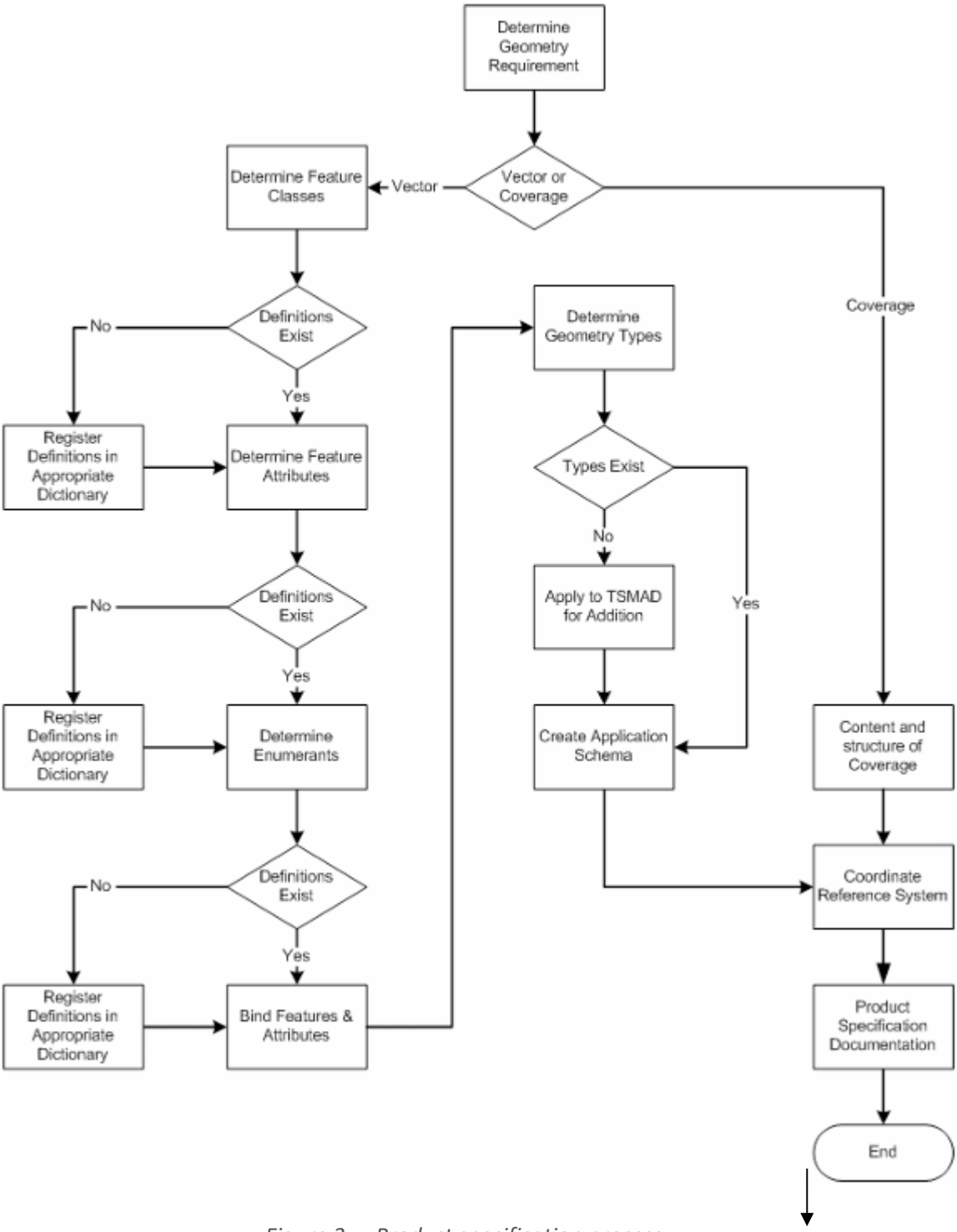


Figure 3 Product specification process

3.1.1. KEY STEPS

Specified in

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

3.1.1.1. Determine geometry requirement

The first step in developing the specification is to determine whether the data will be discrete or continuous. 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 recognisable objects that have relatively well-defined boundaries or spatial extent. Examples could include buildings, or aids to navigation. Continuous phenomena, such as radio signal strength or ground elevation, vary over space and have no specific extent. 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.

3.1.1.2. Determine classes and attributes and relationships

The next step is to identify groups or classes into which the data objects fall and their associated attributes and relationships. 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 two 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.

3.1.1.3. 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 Modelling Language (UML). A physical (encoded) model can be created in Extensible Mark-up Language (XML).

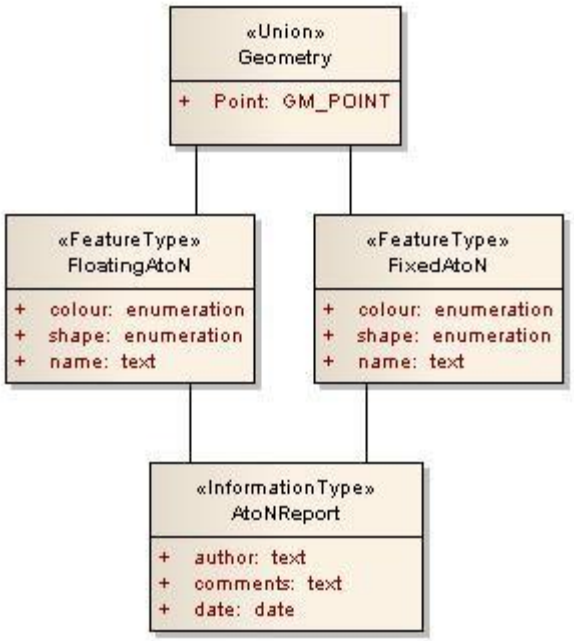


Figure 4 Example model in UML

If the application involves complex structures or relationships, these can more easily be visualised 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 S-100 application schemas are realised in a Feature Catalogue that is encoded in XML. This defines the features, information types and attributes used within a data product.

3.1.1.4. Co-ordinate Reference System

The appropriate Co-ordinate 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.

3.1.1.5. Units of measure

Measurement units need to be specified.

EXAMPLE: metres, nautical miles.

3.1.1.6. Data Quality

Accuracy of data and validation procedures should be indicated.

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

3.1.1.7. 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.

3.1.1.8. 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*.

3.1.1.9. 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 5) 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 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 5 Example of XML Schema for Buoys (GLA/UKHO)

4. IALA PRODUCT SPECIFICATION PROCESS

In the previous sections, information was provided about the S-100 GI-Registry and how this will foster the realization of the maritime services in the context of e-Navigation. 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 6, together with the product specification template (S-100 part 11 Appendix 11-D) can be used as a reference in the development of product specifications.

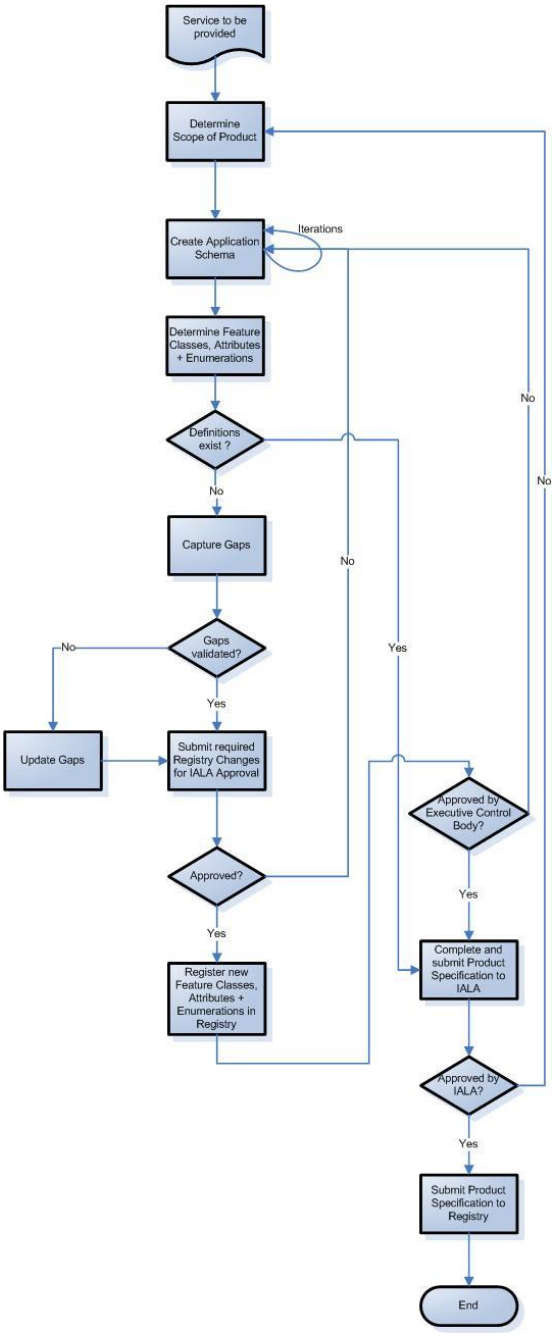
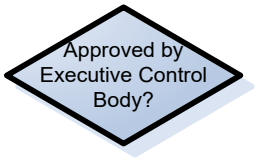


Figure 6 IALA Product Specification Process

Since a flowchart cannot contain the full context of the steps in de process. The steps of the process as seen in Figure 6 are briefly explained in 0.

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 organisation, which has endorsed the action to create an S-200 series 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, utilising 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, else 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.

	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.
	With all needed definitions registered in the GI Registry, the product specification can be completed and submitted to IALA for review and approval.
	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.
	Once complete, the task group can be requested by IALA to submit the finished product specification to the Product Specification Register manager.
	All done.

5. DEFINITIONS

The definitions of terms used in this IALA Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

6. ABBREVIATIONS

AIS	Automatic Identification System
AtoN	Aid(s) to Navigation
CMDS	Common Maritime Data Structure
CRS	Co-ordinate Reference System
DGPS	Differential Global Positioning System
DNP	Distributed Network Protocol
ENC	Electronic Navigation Chart
FCD	Feature Concept Dictionary (IHO)
GF	General Feature
GFM	General Feature Model (IHO)
GI	Geospatial Information *Registry* (IHO)
GLA	General Lighthouse Authority(ies)
GML	Geography Markup Language
HMI	Human-machine interface
HSSC	Hydrographic Services and Standards Committee (IHO)
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardisation
IVEF	Inter VTS Exchange Format
LANBY	Large Automatic Navigation Buoy
MSP	Maritime Service Portfolio
NAV	Sub-Committee on Safety of Navigation (IMO)
NCSR	Sub-Committee on Sub-Committee on Navigation, Communications and Search and Rescue (IMO)
OGC	Open Geospatial Consortium
Racon	Radar beacon
SN Circ.	Safety of Navigation Circular (IMO)
S-57	IHO Transfer Standard for Digital Hydrographic Data
S-99	Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry (IHO)
S-100	Geospatial Information Registry (IHO
TSMAD	Transfer Standard Maintenance and Application Development Working Group (IHO)
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office

UML	Unified Modelling Language
VTS	Vessel traffic service(s)
WFS	Web Feature Service
WGS84	World Geodetic System 1984 (Reference co ordinate system used by GPS)
XML	Extensible Markup Language
XSLT	Extensible Stylesheet Language
1D	One dimensional
2D	Two dimensional

7. REFERENCES

[1] IHO. S-99 Operational Procedures

[2] IHO. S-100 Universal Hydrographic Data Model

[3] IALA. Guideline G1087 Procedures for the Management of the IALA Domains under the IHO GI Registry