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# S-100: A Brief Introduction

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NOAA Navigaton Services



# S-100 – the IHO building blocks

- Provides the **data framework** for the development of the next generation Electronic Navigational Charting products, as well as other digital products required by the hydrographic, maritime and GIS communities



# Who is developing S-100 product specifications

ENC  
Bathymetry  
Water Levels  
Surface Currents  
MPAs  
UKC

S-20x

S-421 –  
Route  
Exchange

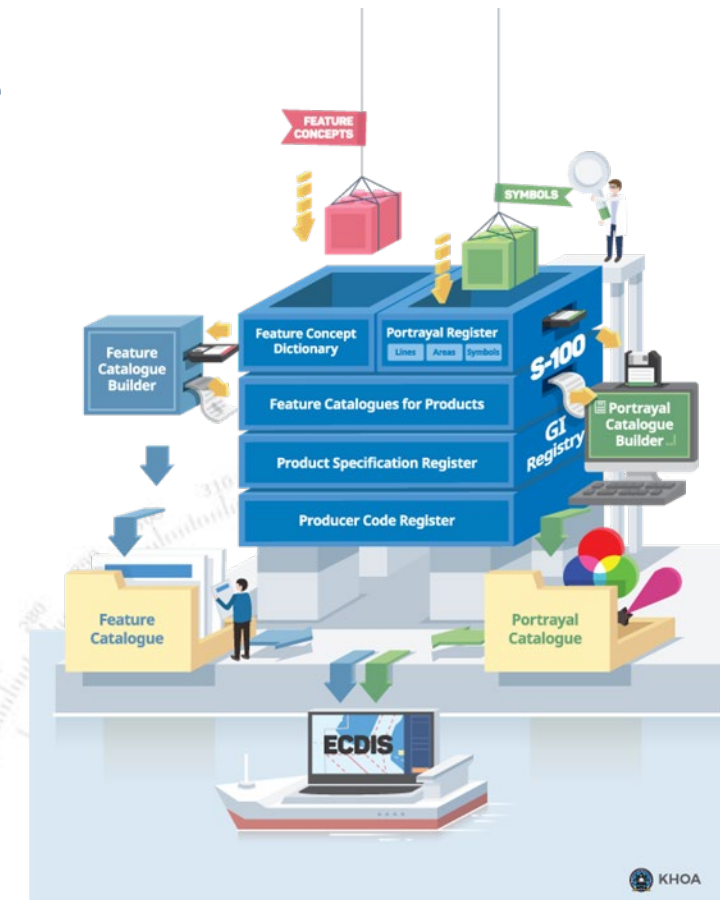


S-411 -  
Ice  
S-412 -  
Weather



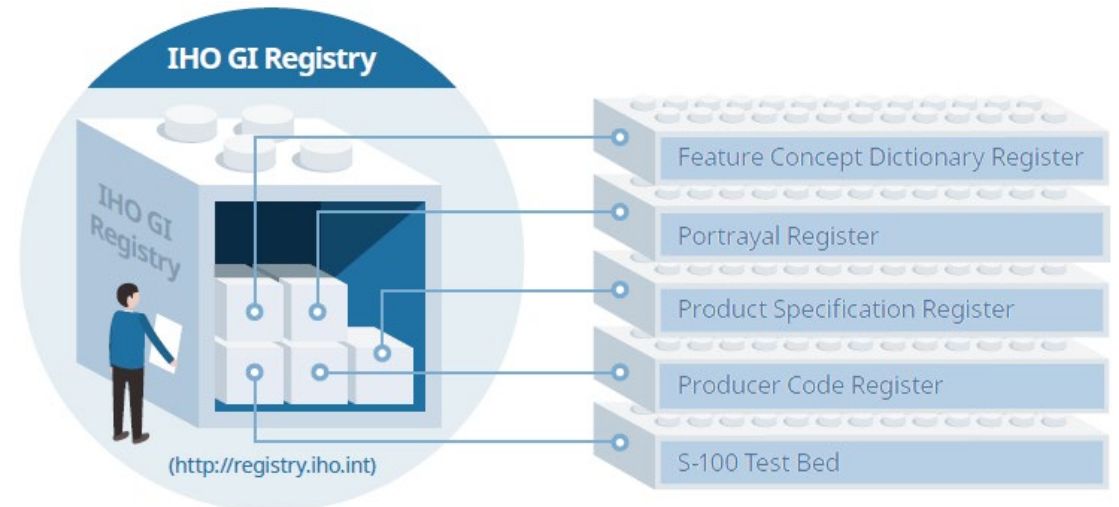
# What does S-100 mean for the Maritime Community?

- Leads to a global **consistency** of products
- Specifies encoding formats based on product type
  - ISO 8211
    - S-101 ENC's
  - HDF5
    - S-102 Bathymetry
    - S-111 Surface Currents
    - S-104 Water Level Information
    - S-412 Gridded Weather Information
  - GML
    - S-412 Vector Weather Information
    - S-122 Marine Protected Areas
- Moves to machine readable catalog mechanism
  - XML Based Catalogues



# S-100 Backbone – Geospatial Information Registry

- Contains a collection of harmonized information divided into a series of registers
  - Feature Concept Dictionary – subdivided into different domains
    - Hydro
    - IALA
    - WMO
    - IEC
  - Portrayal Registers

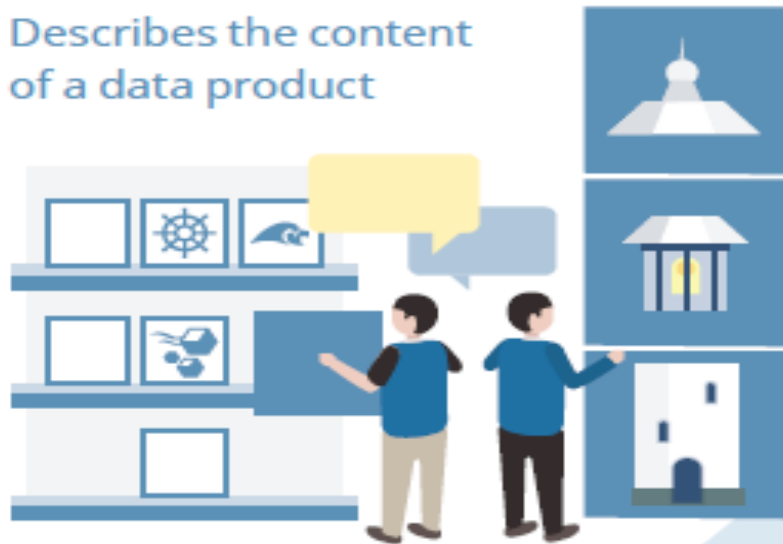


# S-100 Backbone – Catalogue Builders

## Catalogue Builder

### Feature Catalogue Builder

Describes the content of a data product

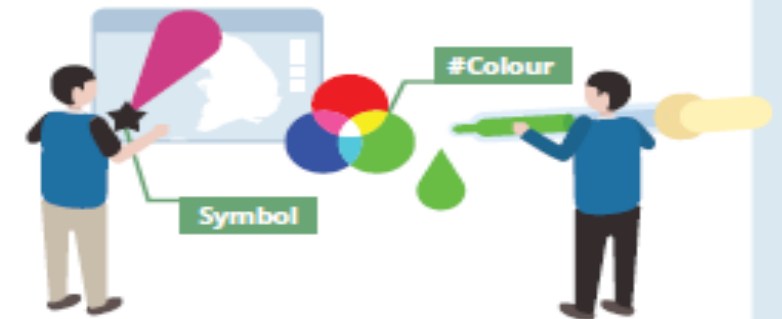


Catalogue Builder

### Portrayal Catalogue Builder

Portrayal functions that map the features to symbol

Contains symbol, colour, portrayal parameter and viewing groups, etc.



# S-100 Based Feature Catalogues

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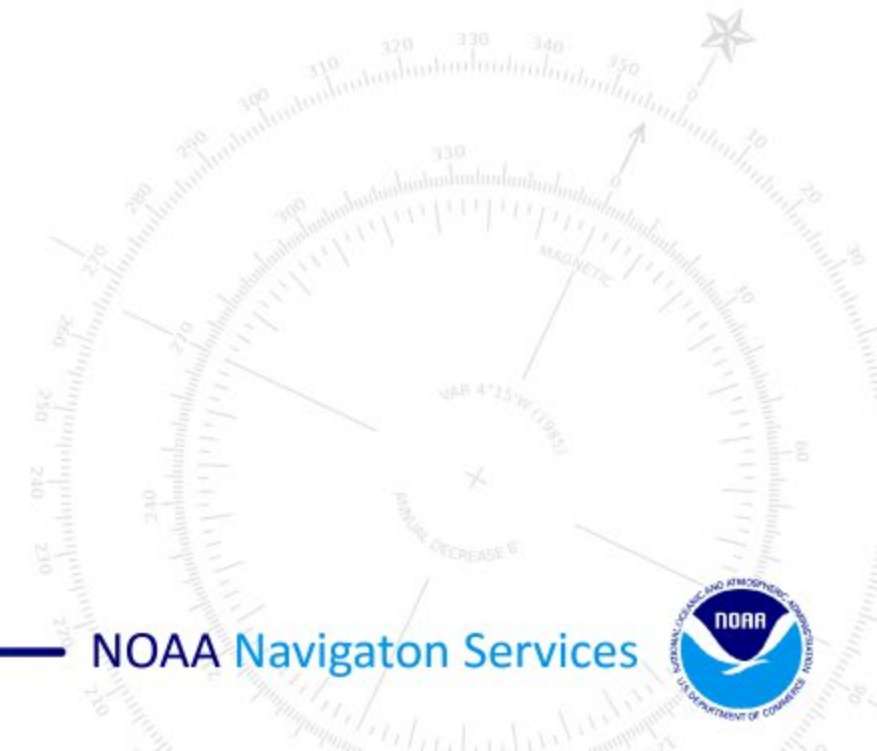
- Machine Readable .xml catalogue
- Binds features and attributes
- Ties in spatial primitives – Point, Curve and Surface.

```
<S100FC:S100_FC_SimpleAttributes>
- <S100FC:S100_FC_SimpleAttribute>
  <S100FC:name>Application Profile</S100FC:name>
  <S100FC:definition>name of an application profile that can be used with the online resource (ISO 19115)</S100FC:definition>
  <S100FC:code>applicationProfile</S100FC:code>
  <S100FC:alias>APPPRF</S100FC:alias>
  <S100FC:valueType>text</S100FC:valueType>
</S100FC:S100_FC_SimpleAttribute>
- <S100FC:S100_FC_SimpleAttribute>
  <S100FC:name>Beacon shape</S100FC:name>
  <S100FC:definition>The shape a beacon exhibits</S100FC:definition>
  <S100FC:code>beaconShape</S100FC:code>
  <S100FC:alias>BCNSHP</S100FC:alias>
  <S100FC:valueType>enumeration</S100FC:valueType>
- <S100FC:listedValues>
  - <S100FC:listedValue>
    <S100FC:label>Stake, Pole, Perch, Post</S100FC:label>
    <S100FC:definition>An elongated wood or metal pole, driven into the ground or seabed, which serves as a navigational aid or a
```

# S-100 Based Portrayal Catalogues

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- Machine Readable set of symbols and portrayal rules
- S-100 defines two types of portrayal mechanisms
  - LUA – used for S-101 portrayal and best for portrayal rules that need to use external conditions to generate the portrayal (ship's draft)
  - XSLT – simplified rules based on XML style sheets
- **Navigation Systems MUST implement both**





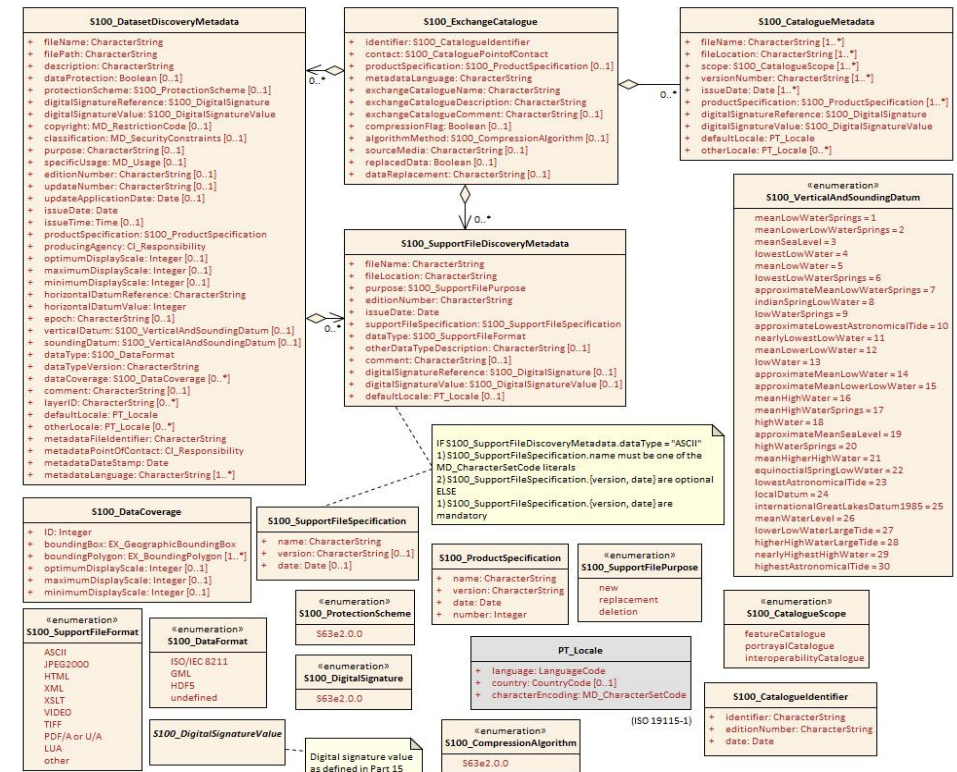
# S-100 Discovery Metadata – Information Exchange

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- Implemented utilizing XML exchange catalogues
- Contains:
  - Metadata about the overall exchange catalogue
  - Metadata about the individual datasets
  - Metadata about the support files that make up the package
- At the S-100 level most everything is optional
  - Restrictions may occur at the product specification level
  - Not every specification uses every field

# Discovery for Dissemination

- Building out a central metadata database to handle the dataset metadata
- XML allows for discovery:
  - When new data is released
  - Where the data is stored
  - Where the data is geographically
  - What type of data it is
  - Who produced the data









# What is contained in S-100

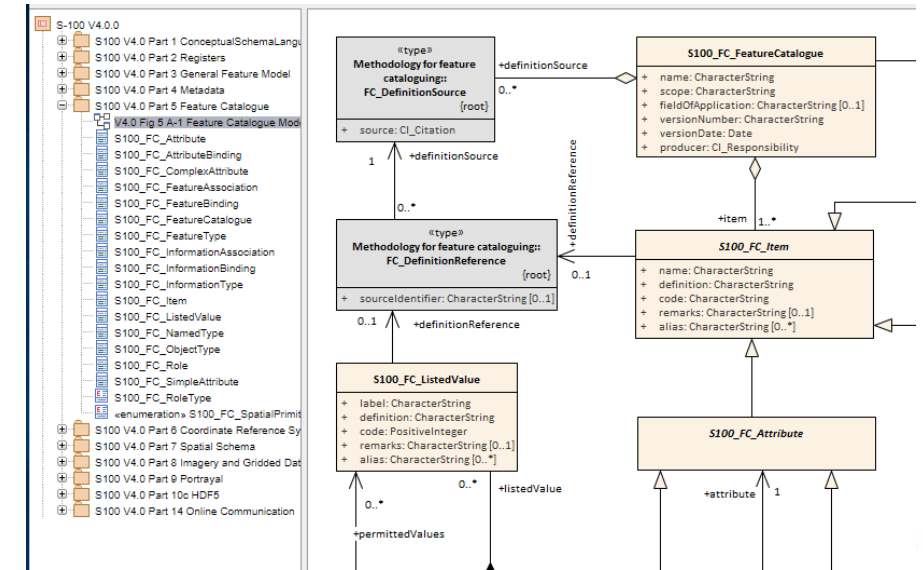
- 15 Different Parts
- Defines
  - Register structure and management
  - Defining the General Feature Model
    - Modelling the real world for machines
  - Metadata
  - Feature Catalogues
  - Coordinate Reference Systems
  - Spatial – otherwise known as geometry
  - Imagery and Gridded Data
  - Portrayal Mechanisms
  - Data Encoding
  - Scripting Language
  - Online Communication
  - Data Protection

Conceptual Schema Language	S-100 Part 1
Management of IHO Geospatial Information Registers	S-100 Part 2
Feature Concept Dictionary Registers	S-100 Part 2a
Portrayal Register	S-100 Part 2b
General Feature Model and Rules for Application Schema	S-100 Part 3
Metadata	S-100 Part 4a
Metadata for Imagery and Gridded Data	S-100 Part 4b
Metadata – Data Quality	S-100 Part 4c
Feature Catalogue	S-100 Part 5
Coordinate Reference Systems	S-100 Part 6
Spatial Schema	S-100 Part 7
Imagery and Gridded Data	S-100 Part 8
Portrayal	S-100 Part 9
Portrayal (Lua)	S-100 Part 9a
Encoding Formats	S-100 Part 10
ISO/IEC 8211 Encoding	S-100 Part 10a
GML Encoding	S-100 Part 10b
HDF5 Encoding	S-100 Part 10c
Product Specifications	S-100 Part 11
S-100 Maintenance Procedures	S-100 Part 12
S-100 Scripting Language	S-100 Part 13
Online Communication Exchange	S-100 Part 14
Encryption and Data Protection	S-100 Part 15

# Where do I find information?

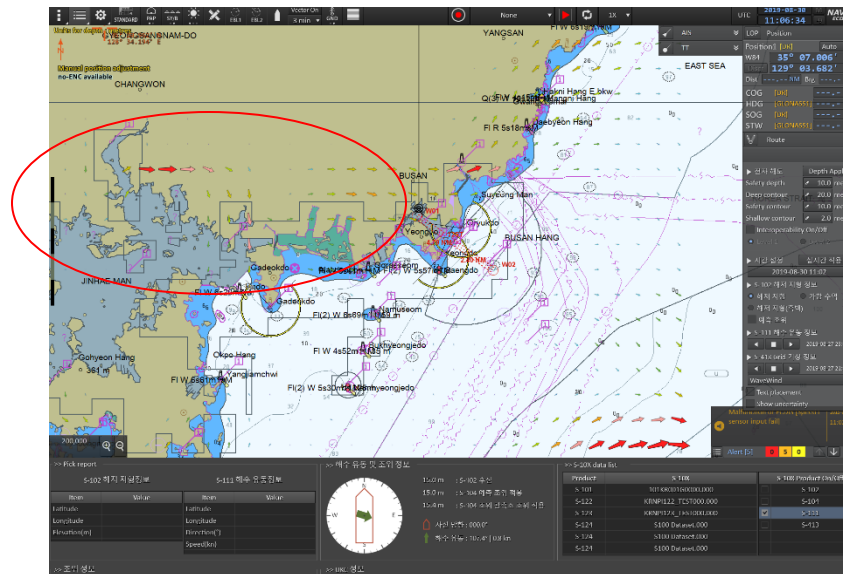
- <http://s100.iho.int/S100/>
  - Links to the latest edition of S-100
  - S-100 Schemas (stored on Github)
  - S-100 UML models
    - Downloadable via Github
    - HTML version

Type	Description/Link	Edition/Date	Comment
	<a href="#">S-100 Edition 4.0.0 Schema packages - Readme</a>	November 2018	See below
	<a href="#">S-100 Edition 4.0.0 Schema packages</a>	November 2018	See Readme - above
	<a href="#">S-100 UML Model</a>	April 2017	S-100 Github - download
	<a href="#">S-100 UML Model - HTML Version</a>	September 2018	HTML version of the UML models
	<a href="#">S-100 Schemas</a>	February 2018	S-100 Github
	<a href="#">S-100 Master Plan Document</a>	(June 2015)	

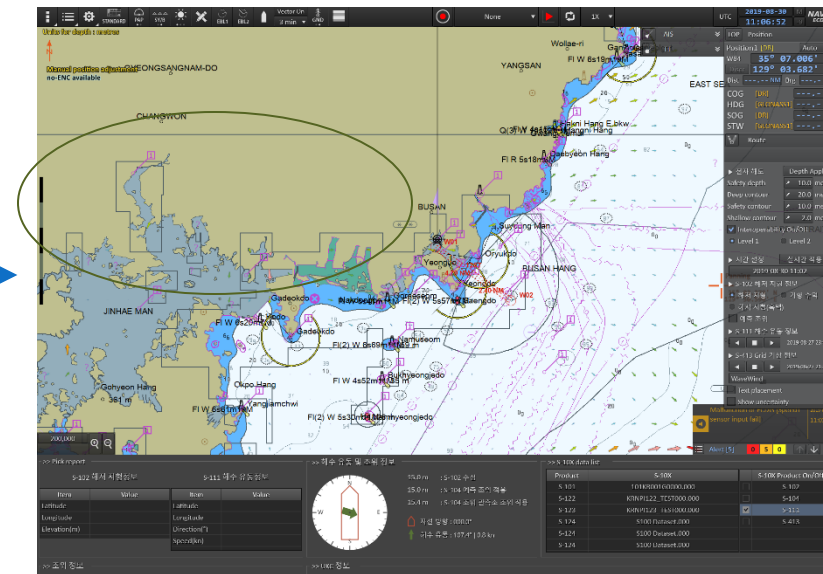


# S-98 – S-100 Interoperability for Navigation Systems

- Framework for capturing interoperability rules for use in ECDIS
- Machine readable mechanism for rules
- Harmonized graphical presentations of S-100 data products



No Rules Applied



Rules Applied

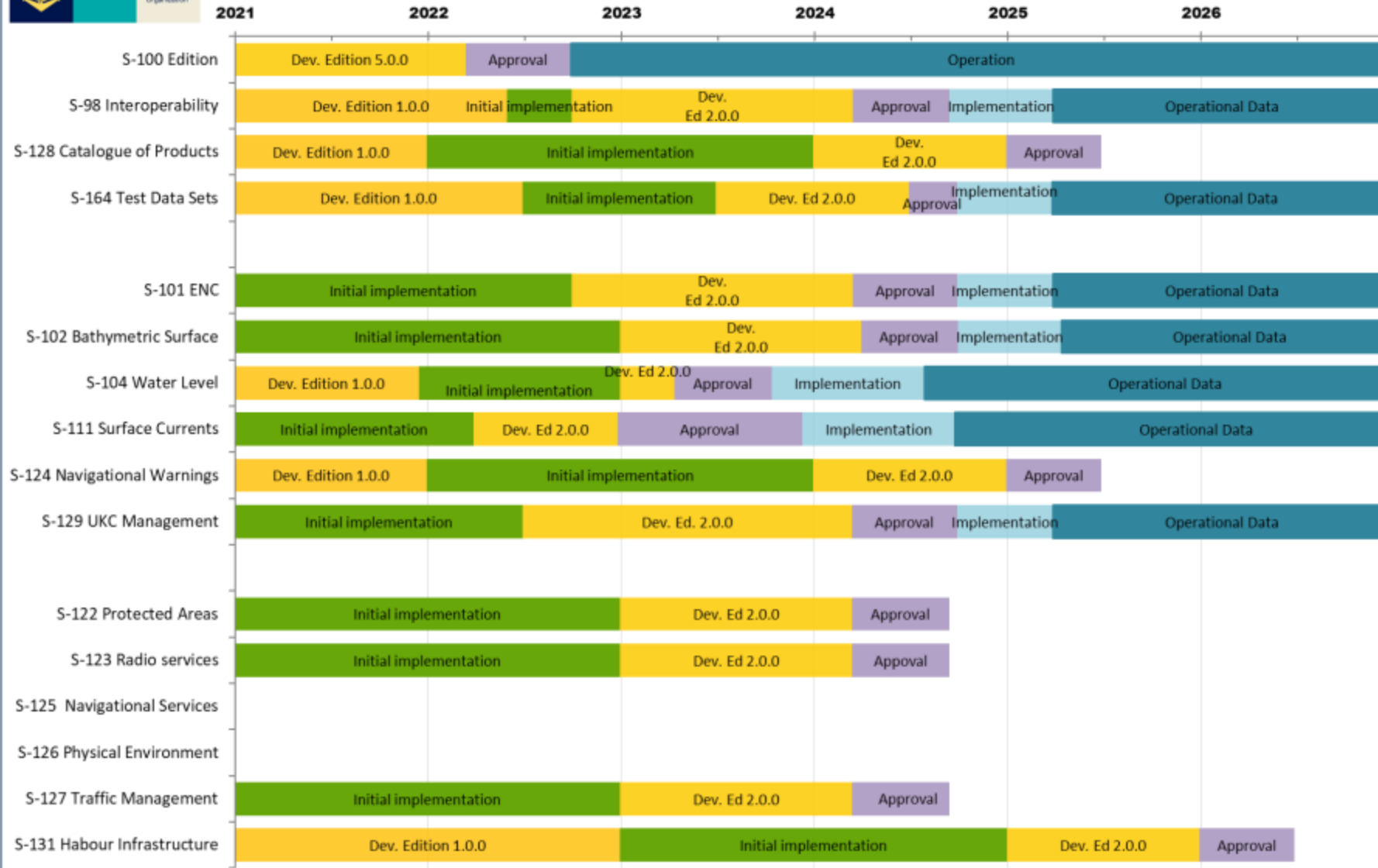
# What is the S100WG focusing on now?

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- Finalizing Edition 5.0.0 of S-100
  - Improved Discovery Metadata
  - Encryption
  - Real-Time information
- Finalizing Edition 1.0.0 of S-98
  - Allows for tide adjustment of data on an ECDIS



## S-100 PRODUCT SPECIFICATIONS DEVELOPMENTS AND TIMELINE



### The S-100 timeline;

- to be maintained by the IHO Secretariat,
- version controlled Gantt Diagram,
- updated and reported annually to the IHO Council.

Reference: C4/18, 20 and 22

# Key Takeaways

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- Standards are the building blocks to Precision Navigation
  - Harmonization of data
  - Improved interoperability
  - **But** .... They do take time
- If data producers move to leveraging consensus based standards it can lead to lower implementation costs for the manufacturer
  - Can lead to lower cost for the consumer
  - Can lead to increased uptake of the product



# The World of S-100

