

# The International Hydrographic Organization (IHO) S-100 Standard.



TWLWG – 25 March 2014

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# TWLWG – S-100 Based Product Specification

## **TWLWG Report to HSSC5 - Future work programme - November 2013.**

Liaise with TSMAD on tidal matters and develop, maintain and extend a ;

- Product Specification for the **transmission of real-time tidal data** (IHO Task 2.7.4 refers)
- Product Specification for **Dynamic Application of Tides in ECDIS** (IHO Task 2.7.5 refers)

# IMO e-Navigation has adopted S-100 as the base standard navigational products.

Next Generation ECDIS

IHO S-100  
Single Window

Challenges

S-100, S-101, S-10x  
Standards

S-101  
(Next Generation  
ENC)

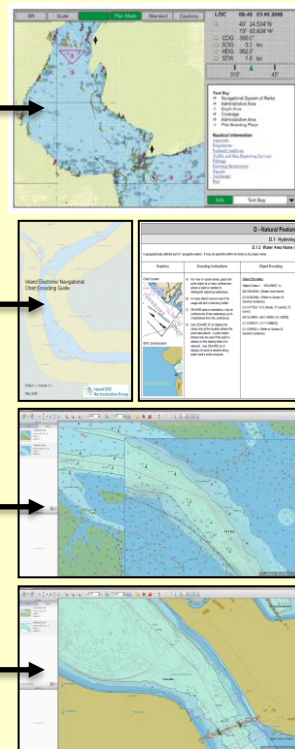
S-102  
(Bathymetric)

S-10x  
(Inland)

S-10x  
(Elec. Nautical  
Publication)

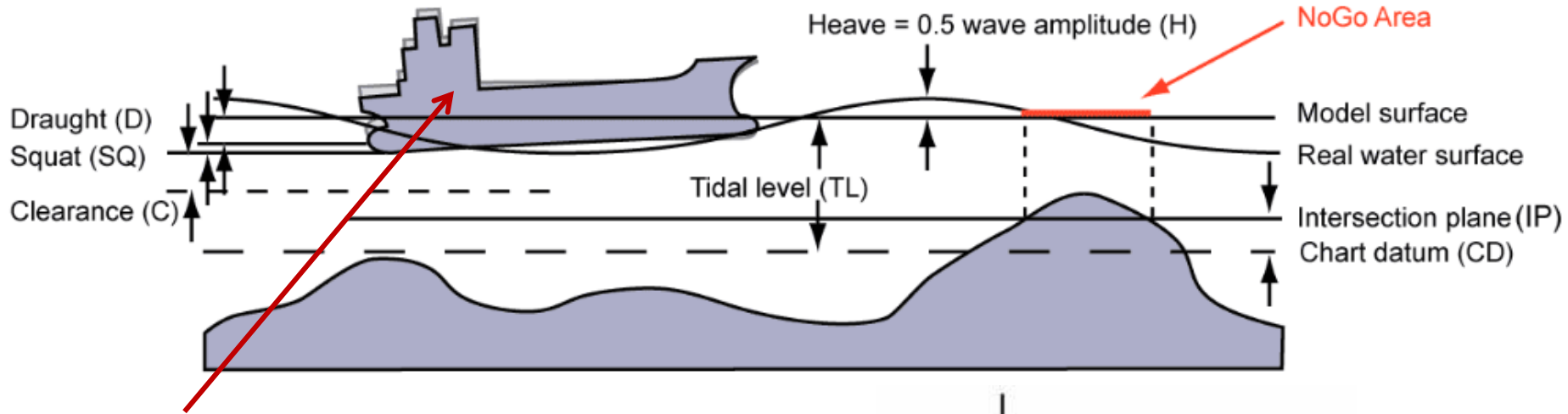
S-10x  
(Weather/Environment)

S-10x  
(Marine Safety  
Overlay)



- ✓ S-57 to S-101 conversion
- ✓ S-101 implementation
- ✓ S-101 Display
- ✓ S-100 products overlay
- ✓ Conventional ECDIS functions
- ✓ New ECDIS functions
- ✓ S-101 ENC Onboard Test
- ✓ S-101 ENC Quality Assessment
- ✓ S-101 ENC Protection
- ✓ S-10x Product distribution

# The Challenge



Real time  
or

```
011001011
011010100
100011010
```

Predicted data

## Requirements

ENC (S-101)

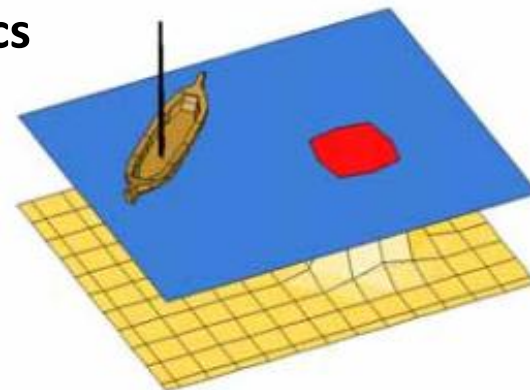
**Bathymetry (S-102) ?**

**Tidal data (S-10n) ?**

**Vessel parameters/dynamics**

**Quality parameters**

**Portrayal ?**



# Why not S-57?

S-57;

... was developed during the late 1980s to the late 1990s

... it reflects the technology of that period

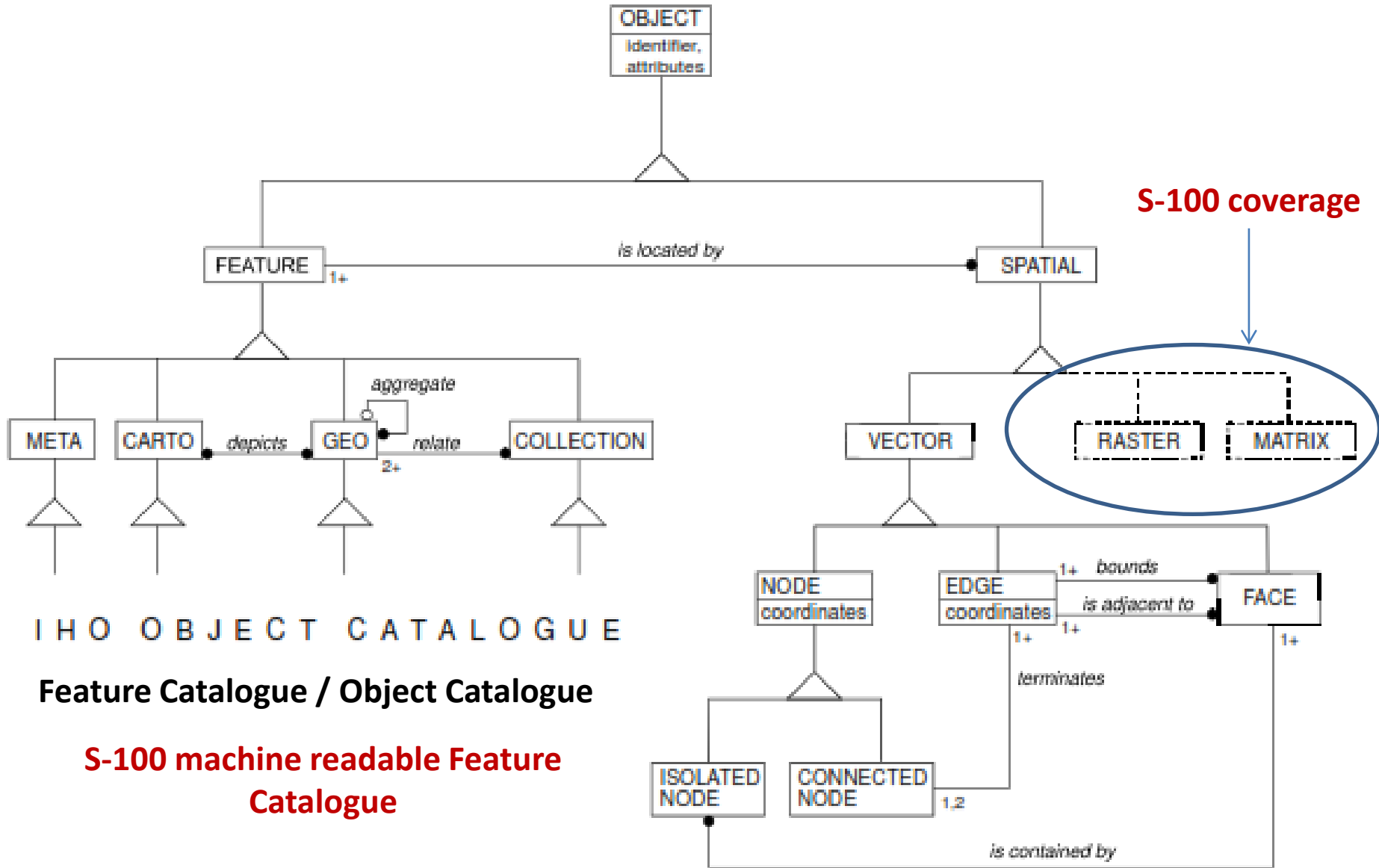
... was developed primarily for ENC data exchange

S-57 has a number of **limitations** which include;

... inflexible **maintenance regime**;

... not able to support contemporary requirements e.g. **gridded data, time varying information** etc ...

... **embedded data model** and only one **encapsulation format** (i.e. ISO 8211)



IHO OBJECT CATALOGUE

Feature Catalogue / Object Catalogue

S-100 machine readable Feature Catalogue

# Currently – S-57 ECDIS Safety Contour



6 metre safety contour



10 metre safety contour

# S-100 – Based on ISO/TC211 Conceptual Standards





# S-100 Document Parts

Part 1 ISO 19103 - Conceptual schema language ISO

Part 2 a+b ISO 19135 - Procedures for registration of items of geographic information

Part 3 ISO 19109 - **Rules for application schema**

**Part 4a+b ISO 19115 - Metadata**

Part 4c ISO 19113 - Quality principles, procedures, measures.

Part 5 ISO 19110 - Methodology for feature cataloguing

Part 6 ISO 19111 - Spatial referencing by coordinates

**Part 7 ISO 19107 - Spatial schema**

**Part 8 ISO 19123 - Schema for coverage geometry and functions**

Part 9 - Portrayal

S-100 Part 10 Encoding formats

S-100 Part 10a ISO/IEC 8211:1994, Specification for a data descriptive file for information interchange structure implementations

S-100 **Part 11 ISO 19131:Data product specifications**

# **S-100 Product Specifications**

Edition 1.0 **published January 2010** - dependent PS;

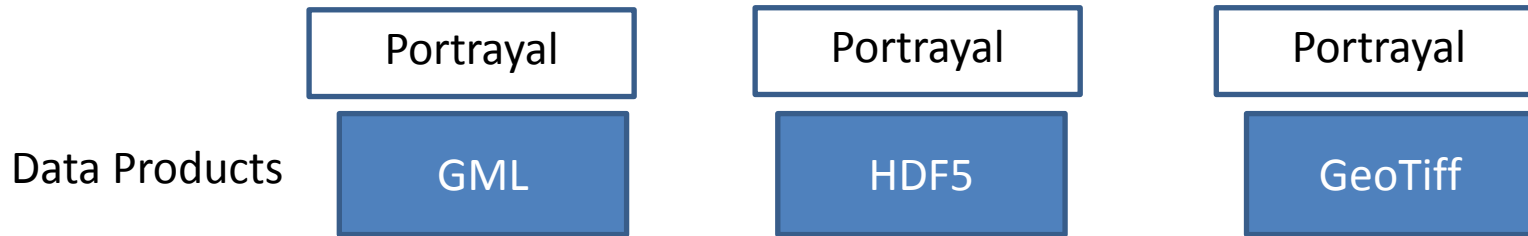
- S-101 – ENC prod spec (near to completion).
- **S-102 - Navigational Surface / BAG**
- **S-10n – Surface Currents**
- **S-10n – Tidal Information**
- **S-10n – Radio Signals**
- S-103 - Maritime boundaries (DUALOS)
- WMO Ice Information
- IEHG Inland ECDIS
- IALA – modelling lights information

## **S-100 Edition 2.0 anticipated to be approved at HSSC6.**

Main new features of the edition;

- **Portrayal Model Chapter 9 (completed)**
- **Provision for Code lists.**
- GML encoding
- Enhancement to the metadata (chapter)
- Provision made for additional geometric types.
- **[S-10n Product Specification Template](#)**

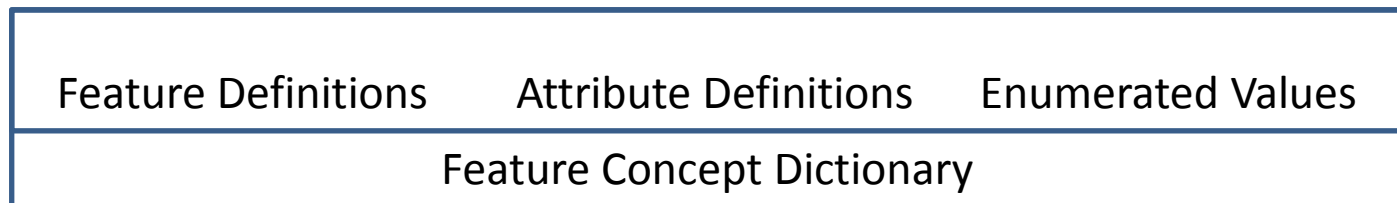
# Separation of Carrier and Content



Feature Catalogue

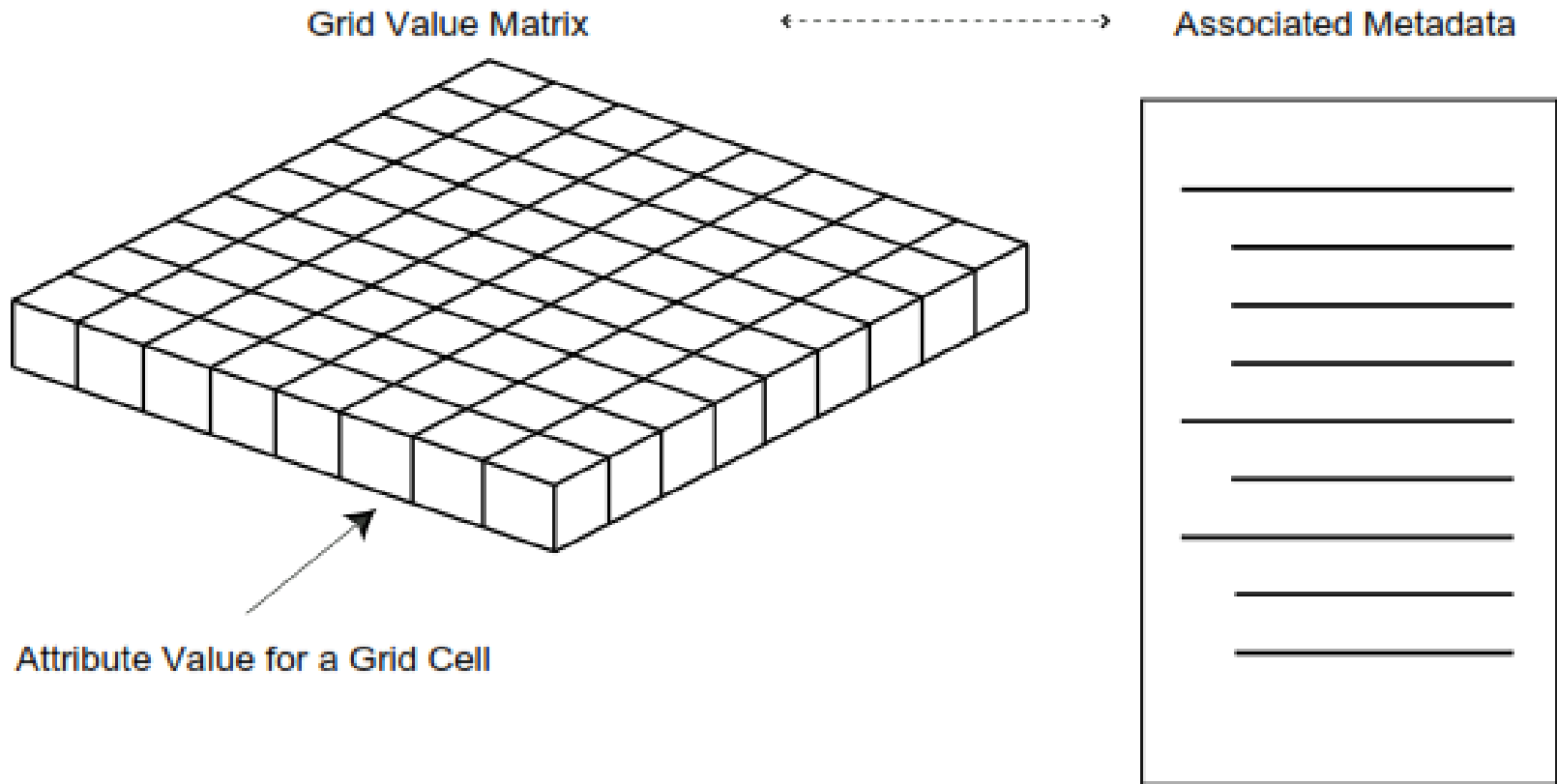
Content Model /  
Application Schema

**content model** is the "information view" of an application schema



**See Paper TSMAD21-4.2.2**

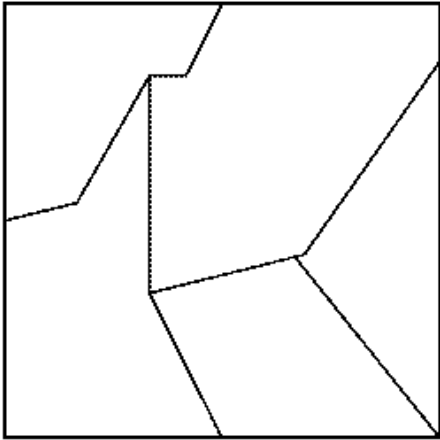
# Quadrilateral Grid



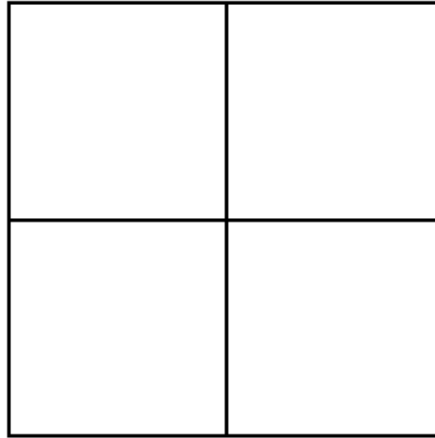




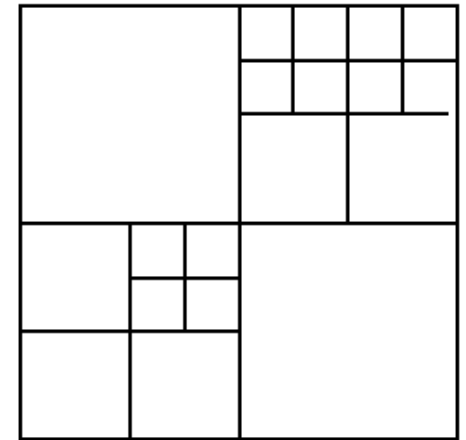
# Tiling Scheme



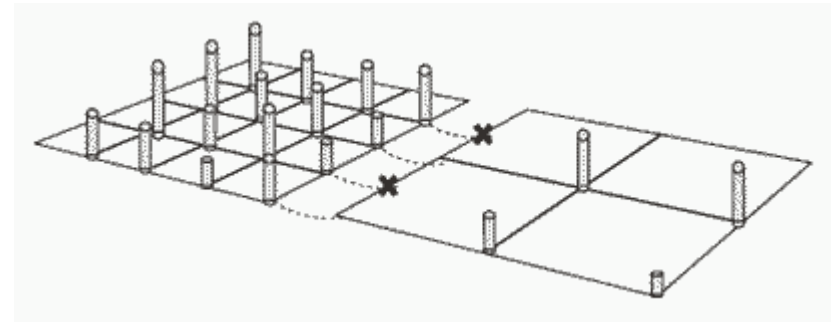
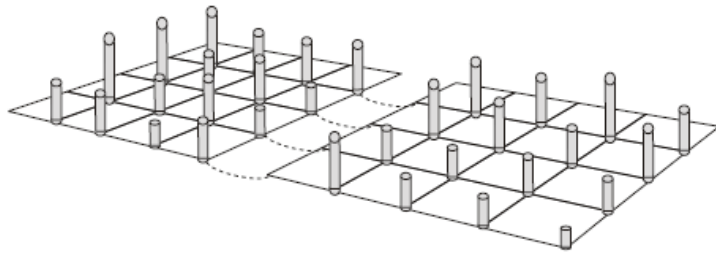
Polygonal



Simple Grid

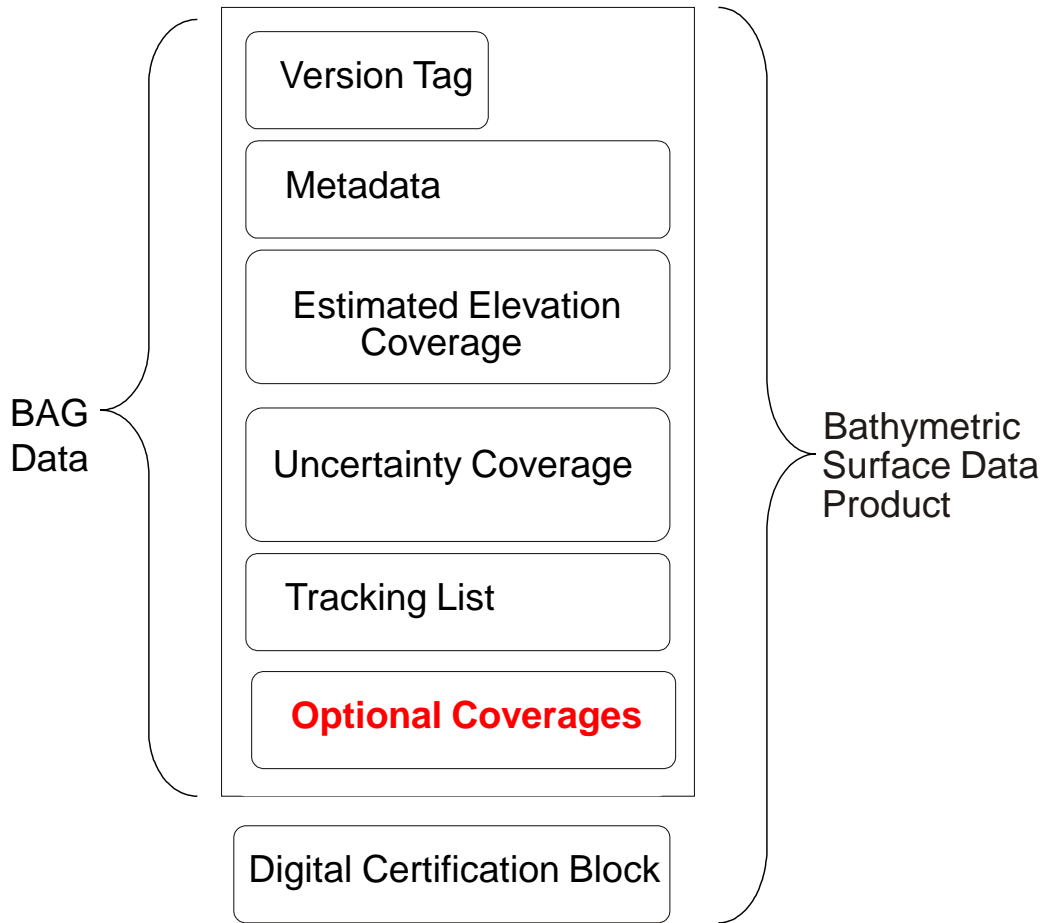


Quad-tree Grid

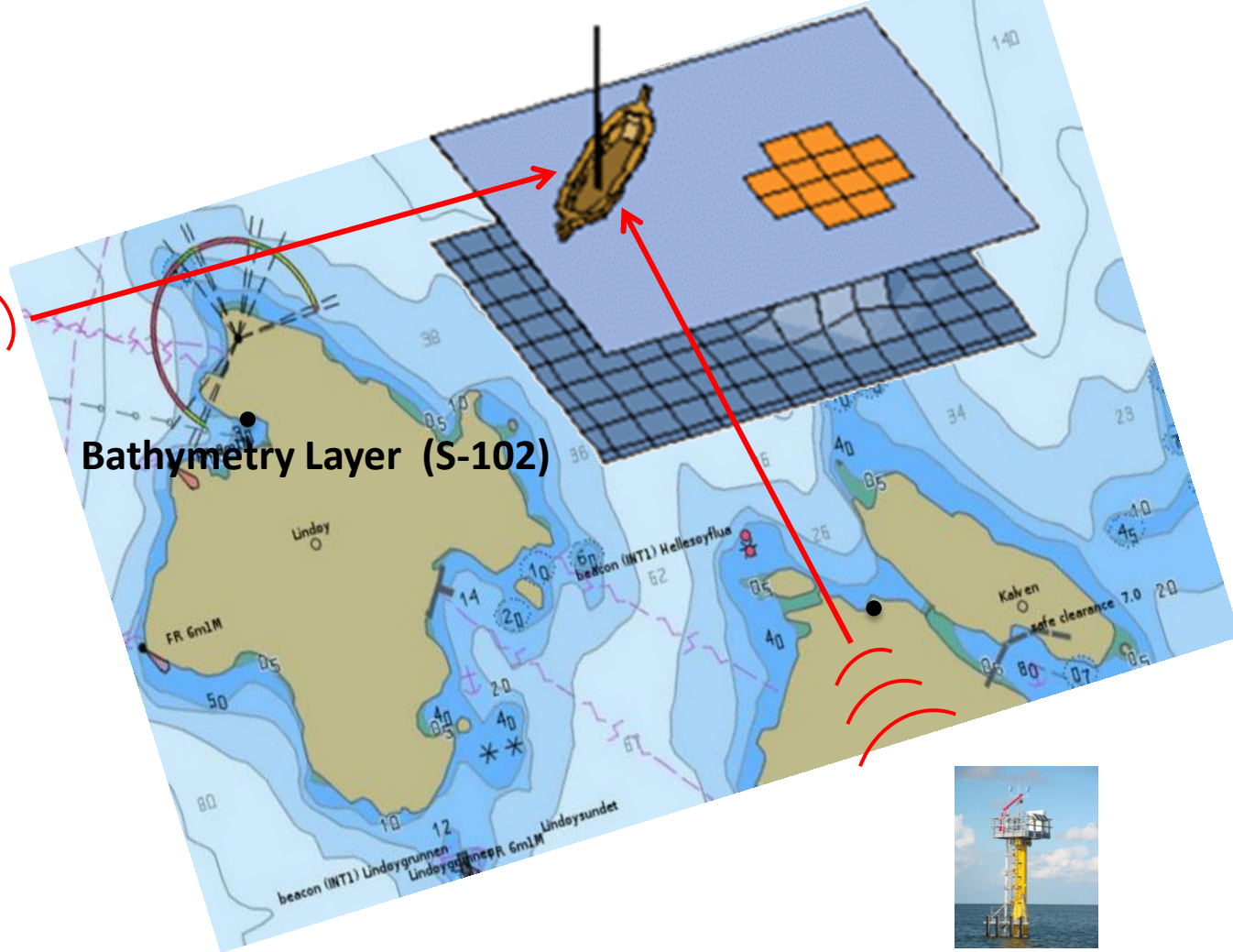




# S-102 - BATHYMETRIC SURFACE PRODUCT SPECIFICATION



# Tidal Layer (Product)



# Bathymetry Layer (S-102)



# Problems or outstanding issues

- The **gridded dataset would effectively become a navigational surface** (based on chart datum CD), and the next issue to consider would be how to apply the tidal model including the temporal component to the navigational surface in order that CD depths are adjusted to reflect the tidal / time variables.
- **The tide adjusted depth at each grid cell would drive the portrayal within the EDCIS.** This could simply be as colour coded bathymetric surfaces, or green (safe) amber (beware) and red (no go) areas based on the vessels draft.

## Gridded Coverage Method

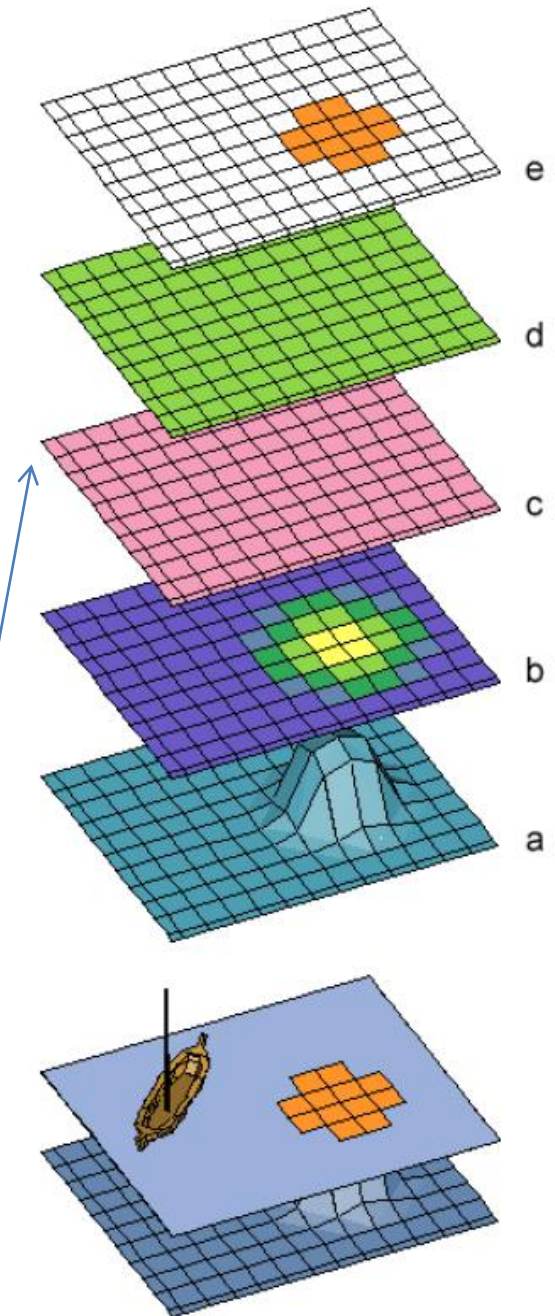
(a) - bathymetry bottom attribute in a grid

(b) - spatial (x, y) or (long, lat) value for each position of each grid box.

(c) - dynamic water level data

(d) – ships draught, heave and squat

(e) – No-go areas – saved in a new grid which could be derived from a simple boolean query  $b + c + d > 0$  for each cell.



# S-100 Product Specifications - Development

1. Develop a Product Specification

App Schema, Metadata, Encoding ....

2. Register items



3. Build a Feature Catalogue

Feature Catalogue

4. Build a Portrayal Catalogue

Portrayal Catalogue

5. Create data products

Data product

6. View in S-100 Software



# Existing S-57 Object / Attributes

## **SISTAW** – Signal Station, warning

A signal station is a place on shore from which signals are made to ships at sea. (IHO Dictionary, S-32, 5th Edition, 4742)



## Category of Signal Station, Warning

**SISTAW** – Signal Station, warning

**CATSIW = 12** (tide gauge measuring device)

**CATSIW = 13** (tide scale)

**CATSIW = 15** (tide gauge measuring device in non-tidal waters)

**CATSIW = 10** – should be reviewed for interpretation and requirement

# Other S-57 Attributes

T_ACWL	Accuracy of water level in terms of both height units and time to a 95% C.L.
T_MTOD	Method of tidal prediction covering both harmonic and non-harmonic
T_VAHC	Harmonic constituent list as an array
T_THDF	Time and height differences comparative to a reference station
T_HWLW	Date/Time and height pairs of high and low waters
T_TINT	Time interval between data values
T_TSVL	Tidal height above/below datum in a time series
TIMEND	Time format for the end of an active period
TIMSTA	Time format for the start of an active period
COMCHA	Communication channel - VHF only
ESTRNG	Estimated range (distance) of transmission
CATCTR	CATCTR = 4 (Benchmark) CATCTR = 1 (Triangulation Point)
VERDAT	Currently a list of 30 different vertical reference datum.

Questions ?