# Project Proposal submitted by KRISO / CCG
## - Portrayal of S-102 with S-101 on an S-100-compatible ECS-

12 July. 2023

KRISO (Korea Research Institute of Ships & Ocean Engineering)

Sewoong OH

# 01 Overview

- **Project title**
  - Portrayal of S-102 with S-101 on an S-100 compatible ECS
- **Project objectives**
  - To portray and overlay high resolution S-102 bathymetric data onto S-101 ENCs for optimal display in an S-100-compatible testbed ECS.
  - To validate interoperability of S-101 and S-102.
  - To investigate both identified and potential technical/technological constraints and challenges, and thereafter recommend and justify possible resolution paths.
  - To explore the possibilities of using S-102 data for marine digital twin applications

# 01 Overview

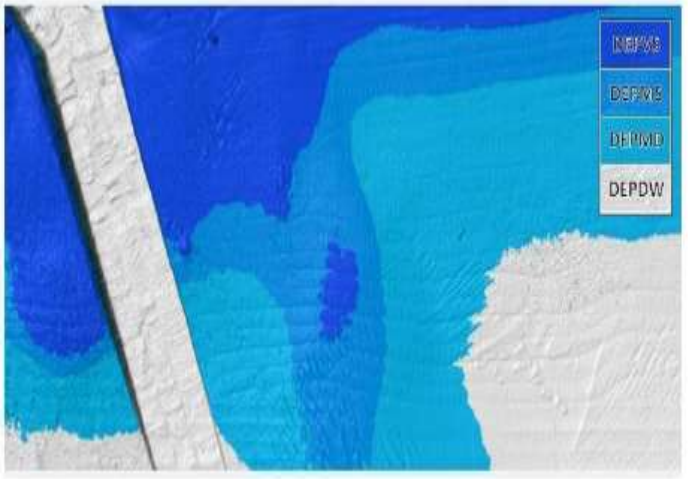
- **Project deliverables**
  - Fit-for-purpose portrayal of high-resolution S-102 bathymetric data onto S-101 ENC, for example use of colour banding or depth contouring in the testbed ECS.
  - Functional standards-based methodology to enable the integration of S-101 and S-102 datasets.
  - Validation of methods (as per S-98 Interoperability Catalogue) for deconflicting discrepancies and to process a variety of S-102 data formats and its derived products (contours and/or depth areas) with other data such as S-101.
  - Recommendations on appropriate bathymetric data i.e., at various resolutions to produce optimal S-102 products, including examining the use of shoal-bias or exact bathymetric data for data processing.
  - Test cases of applying S-102 data to marine digital twin.

# 02 Gaps of S-102 portrayal

- **S-102 Bathy surface product specification**
  - Display of gridded bathymetry
  - Colouring options to support safe navigation.

Table 4 — Depth Zone and Colour Token Information for Day

| Depth Zone Name | Description | Colour | X | Y | L |
|---|---|---|---|---|---|
| Deep Water (DEPDW): | Deeper than the deep contour | White | .28 | .31 | 80 |
| Medium-deep water (DEPMD): | Depths between the deep contour and the safety contour | Blue | .26 | .29 | 65 |
| Medium-shallow (DEPMS): | Depths between the safety contour and the shallow contour | Blue | .23 | .25 | 55 |
| Very Shallow Water (DEPVS): | Depths between the shallow contour and the zero metre contour | Blue | .21 | .22 | 45 |
| Drying Foreshore (DEPIT): | Intertidal area | YellowGreen | .26 | .36 | 35 |



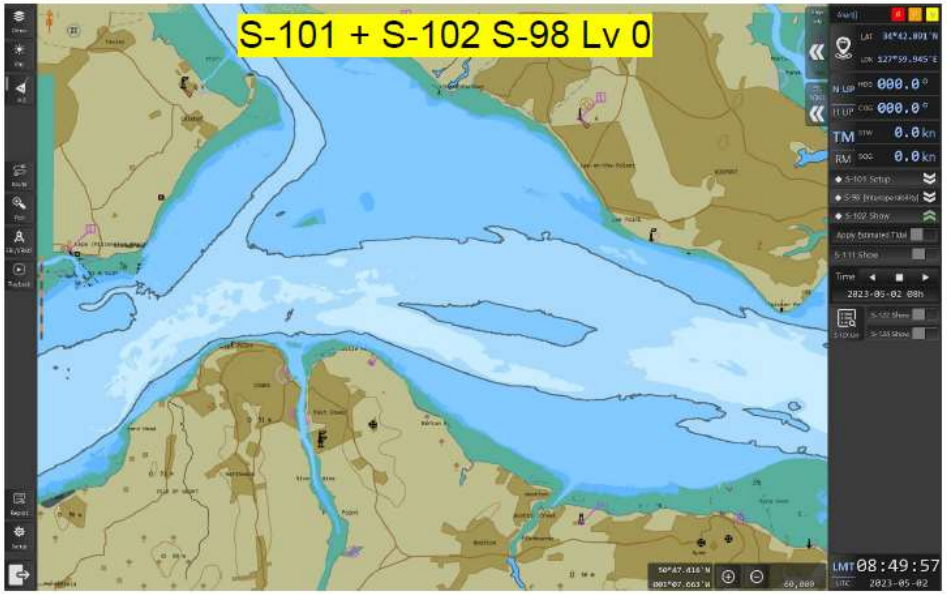

S-102

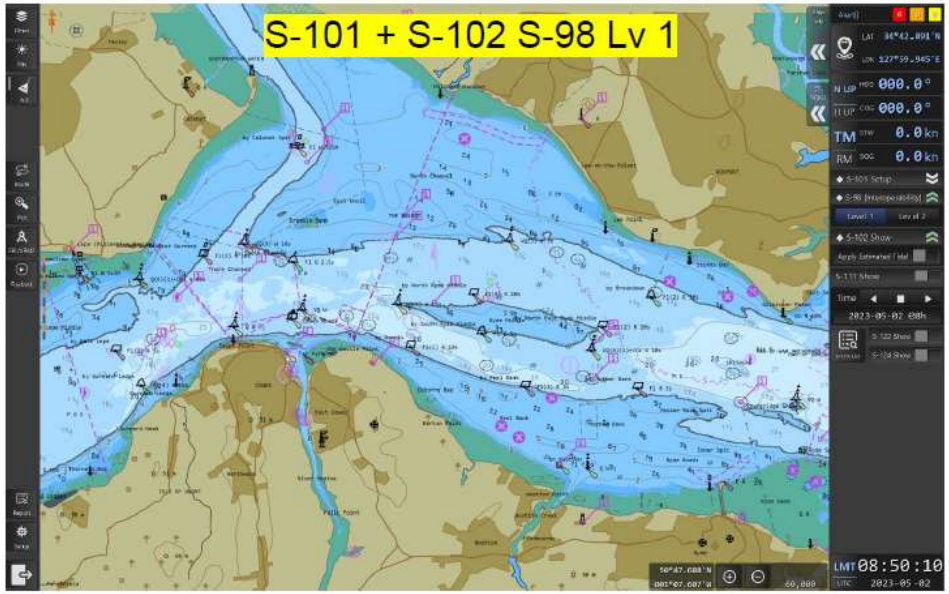
**Annex C**
**Portrayal Catalogue**

NOTE Portrayal Catalogue currently under development.

# 02 Gaps of S-102 portrayal

- **KHOA S-100 Testbed**
  - S-98 Level 0 and Level 1 (UKHO S-101, S-102)



# 02 Gaps of S-102 portrayal

- **KHOA S-100 Testbed**
  - S-98 Level 2 (ROK KHOA S 101 + S 102 + S 104)

(S-101 ENC)


(S-101 ENC + S-102 Bathy surface + S-104 water level, WLA, Safety contour line based on S-102 + S-104))

# 02 Gaps of S-102 portrayal

- **GI Registers – Product Specification**

| Product Information | |
|---|---|
| **Product ID** | S-102 |
| **Title** | Bathymetric Surface |
| **Scope** | Global |
| **Related links** | http://www.iho.int |
| **Abstract** | The Bathymetric Surface Data Product consists of a set of grid value matrix values organized to form a quadrilateral grid coverage with associated metadata representing a bathymetric depth model for an area of the sea, river, lake or other navigable water. The data set includes both depth estimate values and uncertainty estimates associated with the depth values. |
| **Owner** | IHO |
| **Domain** | IHO Hydro |
| **Responsible body** | S-102PT (S-100WG) |
| **Contact** | Yong BAEK yong.baek@iho.int |
| **Remarks** | S-102 Edition 2.2.0 is released for implementation and testing purposes only. |

| Version Information | | |
|---|---|---|
| **Version** | 2.2.0 Published | Uploader:Jeff Wootton/ S-102 Ed 2.2.0_Final.pdf Down [13] |
| **Version Date** | 2023-04-28 | |
| **S-100 Version** | 5.0.0 | |
| **Feature Catalogue** | | Uploader:Jeff Wootton/ S-102 Ed 2.2.0.20230411.xml Down [94] |
| **Portrayal Catalogue** | The S-102 Portrayal Catalogue will be included in a later Edition of S-102. | |

# 02 Gaps of S-102 portrayal

- **S-100 Resource Pages**

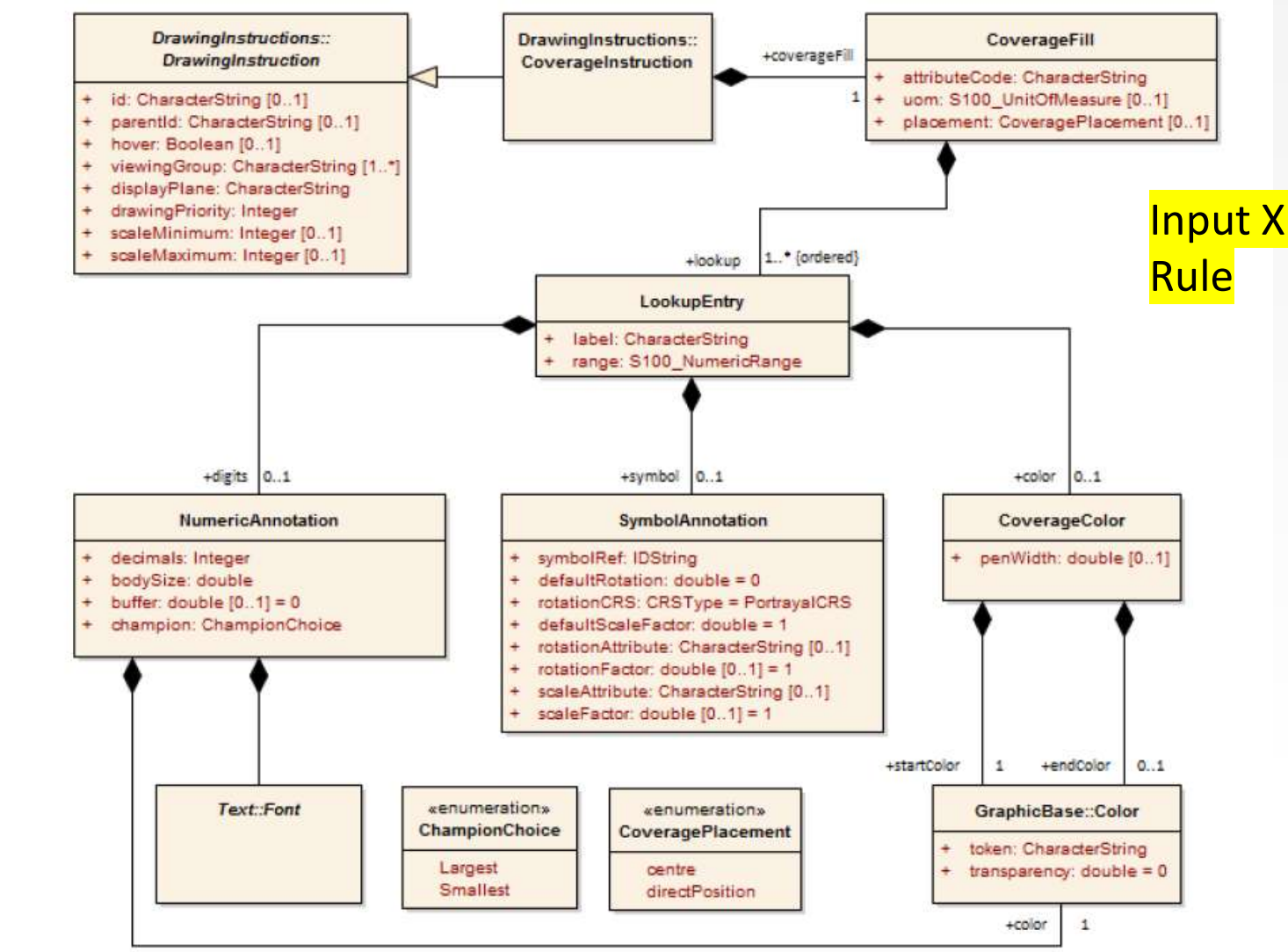
## S-100 based Product Specifications: Phase 1 in the S-100 Roadmap

*Product Specifications are listed below indicating the versions published for testing and development. Component elements can be downloaded from the IHO Geospatial Information (GI) Registry by following the link for each Product Specification entry*

| Product Specification | S-101 | S-102 | S-104 | S-111 | S-124 | S-129 |
|---|---|---|---|---|---|---|
| Compliant to S-100 | S-100 Ed.5.0.0 | S-100 Ed.5.0.0 | S-100 Ed.5.0.0 | S-100 Ed.5.0.0 | | S-100 Ed.4.0.0 |
| Product Specification | S-101 Ed.1.1.0 | S-102 Ed.2.2.0 | S-104 Ed.1.1.0 | S-111 Ed.1.2.0 | | S-129 Ed.1.0.0 |
| DCEG[1] | S-101 Ed.1.1.0 | | | | | |
| Feature Catalogue | S-101 Ed.1.1.0 | S-102 Ed.2.2.0 | S-104 Ed.1.1.0 | S-111 Ed.1.2.0 | | S-129 Ed.1.0.0 |
| Portrayal Catalogue | S-101 Ed.1.1.1 | | | | | S-129 Ed.1.0.0 |
| Validation Checks | S-101 Ed.1.1.1 | | | | | |
| IHO website links | IHO S-101PT | IHO S-102PT | IHO TWCWG | IHO TWCWG | IHO NIPWG | IHO S-129PT |

# 02 Gaps of S-102 portrayal

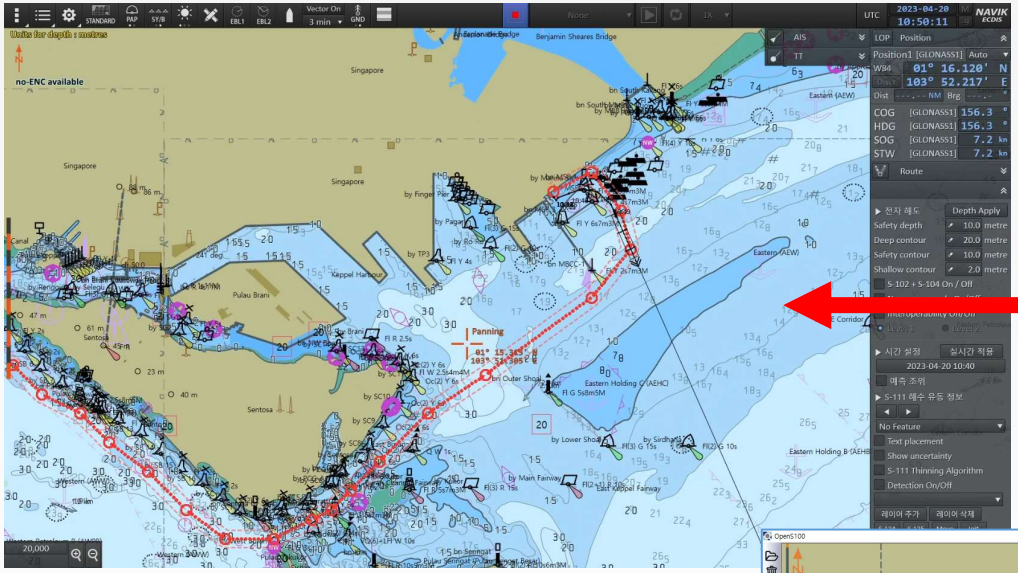
- S-100 Portrayal – Coverage Package




Input XML (Schema) Rule

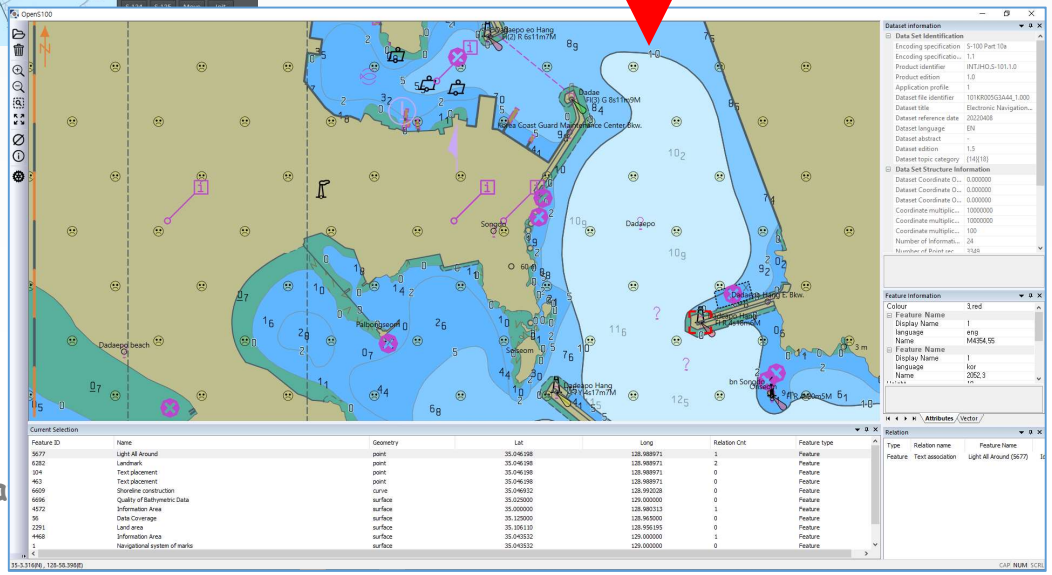
# 03 Research tools

- KHOA S-100 Testbed



KHOA S-100 Testbed
Technology

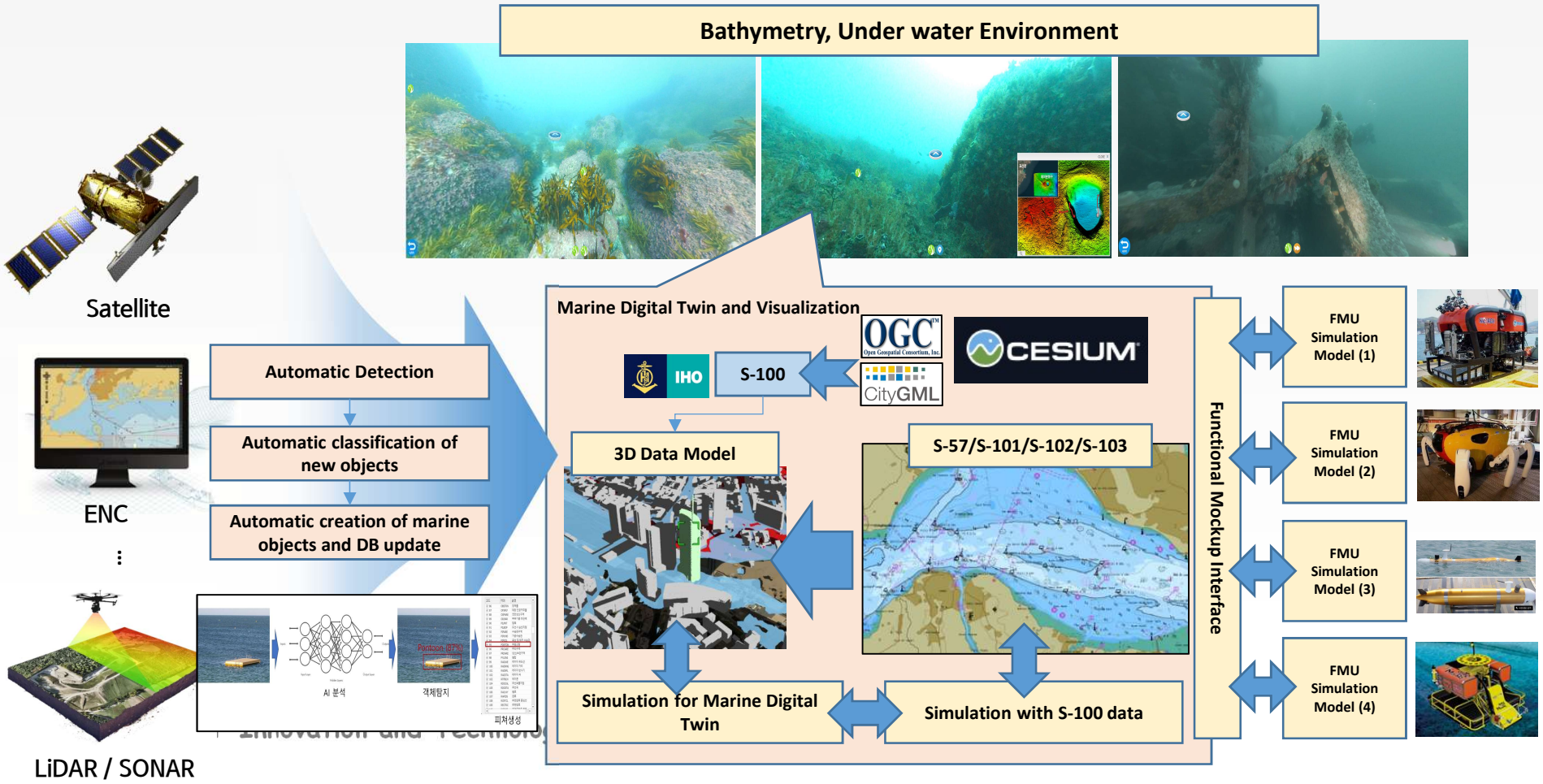
Proposed S-102
Portrayal Catalogue with S-98 IC



OpenS-100
(Open source)

# 03 Research tools

- **KRISO project (Self-funded, 2023 ~ 2027)**
  - To explore the possibilities of using S-102 data for marine digital twin applications



# 04 Practical relevance

- Validation of S-102 enhancing navigational safety and efficiency as a use case, and that it can be implemented and function as envisioned.
- Validation and better understanding of interoperability between S-101 and S-102.
- Identifying of and solutions to any possible gaps to better understand the suitability of colour display, contour lines, depth areas, navigable waters etc described in S-102 product specification.
- Assessment of production of suitable and feasible S-102 products for the desired outcomes.
- Encourage further iteration, refinement and application in context of other high-traffic navigation areas.
- Facilitate other applications such as buoy tending, channel dredging, and reclamation works.
- Lay foundation for digital twin developments and other applications such as S-104 Water Level Information for Surface Navigation datasets with S-101 and S-102 on S-100 ECS/ECDIS to improve end-users' operational overview of the dynamic physical environment.

# 05 Members of Project team

- **Project Lead**
  - Dr. Sewoong OH, Principal Research Engineer, Korea Research Institute of Ships and Ocean Engineering (KRISO)
- **Advisor to Project**
  - Mr. Eivind Mong, Senior Advisor, Canadian Coast Guard (CCG)
- **Hydrographic Offices**
  - Ms. Lynn Patterson, Vice-Chair, S-102 Project Team, IHO | Manager, Canadian Hydrographic Service (CHS)
- **Production of S-102 data**
  - Mr. Lee Weng Choy, Maritime and Port Authority of Singapore (MPA)

# 06 Collaborator scope of work

- **KRISO will provide:**
  - S-100-compatible testbed ECS for the duration of the project, including basic User Interface (UI) mock-ups and interactive "clickable" functions/features.
  - Research & development (R&D) resources and capabilities for harmonisation and portrayal of of S-101 and S-102 datasets in the testbed ECS.
- **CHS will provide:**
  - Past S-102 trial results, including test scenarios and parameters.
- **MPA will provide:**
  - S-102 dataset at various resolutions for the corresponding S-101 cells in the identified demonstration areas

# 07 Project schedule

- **Estimated project duration: Twelve (12) months.**

| Task | Year 1 Q1 | Year 1 Q2 | Year 1 Q3 | Year 1 Q4 | Year 2 Q1 | | | | Parties Involved |
|---|---|---|---|---|---|---|---|---|---|
| Production of S-101 and S-102 dataset for demonstration area | | | | | | | | | • MPA |
| Investigation and validation of S-102 interoperability with S-101 | | | | | | | | | • KRISO<br>• CCG |
| Display of S-102 dataset in Testbed ECS/ECDIS (Demonstration) | | | | | | | | | • KRISO<br>• CCG |
| Exploration of marine digital twin utilization possibilities of S-102 data and production of test cases | | | | | | | | | • MPA<br>• KRISO<br>• CCG |
| Project documentation | | | | | | | | | • MPA<br>• KRISO<br>• CCG |

# THANK YOU

KRISO