



16th Meeting of the Hydrographic Services and Standards Committee

Expert Contributors (EC) – by Chair’s invitation

**Activities in support of the S-100 Implementation
Roadmap, concerns, and recommendations**

Agenda Item 07.12B

HSSC-16, Tokyo, Japan, 27 – 31 May 2024



IHO OVERVIEW OF KRISO

International
Hydrographic
Organization

- Established as Ship Research Institute affiliated with the Korea Institute of Science and Technology in 1973,
- KRISO has continuously conducted R&D in the field of ship and offshore plants, contributing to the development of the shipbuilding and maritime industry in Korea



Daejeon

Korea Research Institute of Ships and Ocean Engineering

Shipbuilding, offshore plant, maritime safety and maritime ICT and technological development

[See details >](#)

Geoje

Offshore Industries R&BD Center

Localization of maritime apparatuses and materials and support of relevant industry

[See details >](#)

Jeju

Wave Energy Test Site

On-site performance evaluation of wave energy and floating offshore wind farm grid connection

[See details >](#)

Goseong

Seawater Energy Research Center

Development of technologies for ocean thermal energy conversion and air conditioning system using deep seawater

[See details >](#)

Ulsan

Autonomous Ship Verification & Evaluation Research Center

Support for Verification of Autonomous Ship and core shipbuilding materials

[See details >](#)

Busan

Deep Ocean Engineering Research Center

Reproduction of deep sea environment and evaluation of maritime structure plant performance

[See details >](#)





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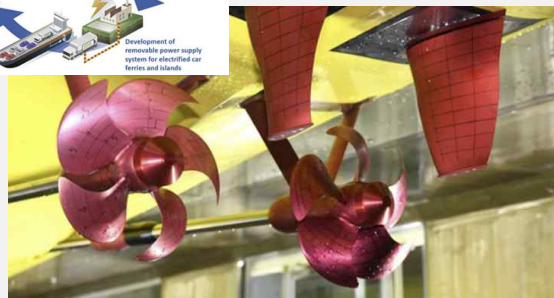
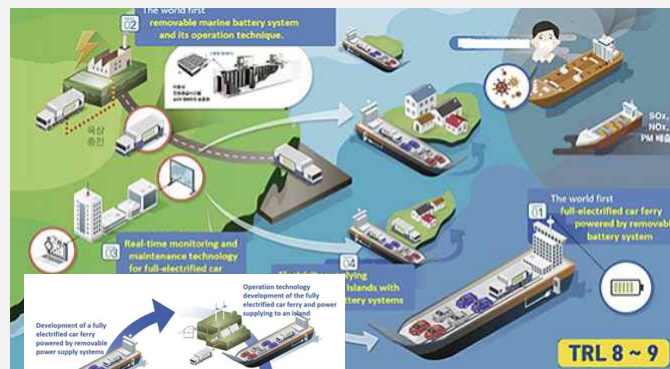
OVERVIEW OF KRISO (MAJOR RESEARCH THEMES)

- Enhancement of ship operation performance, and development of eco-friendly future-oriented ship technology

Development of advanced technology to improve ship operation performance



Development of core technology for low-noise electric ships



Development of core technology for autonomous ships





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OVERVIEW OF KRISO (MAJOR RESEARCH THEMES)

- Development of core technology for future offshore plants

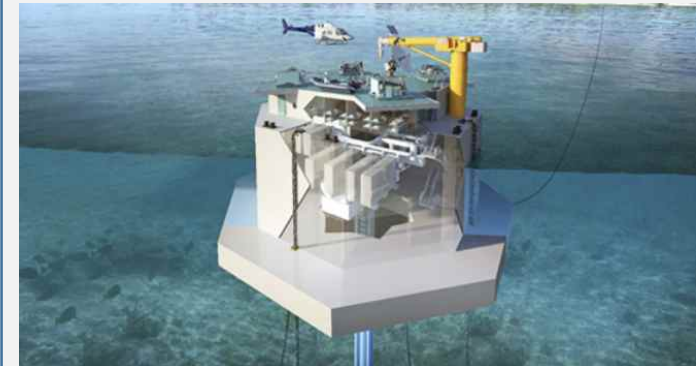
Development of fluid-structure performance evaluation for offshore plants



Development of new industrial services and equipment for offshore plants



Development of leading technology for commercialization of marine energy and resources



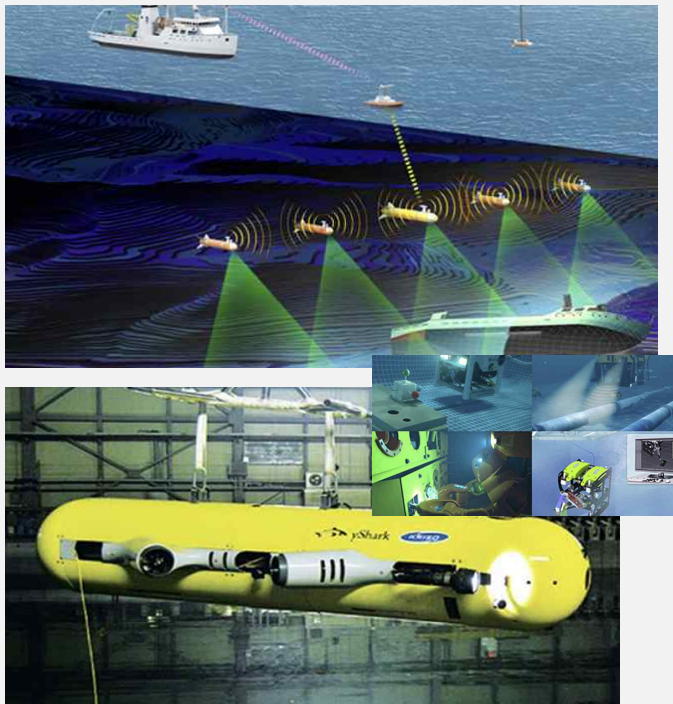


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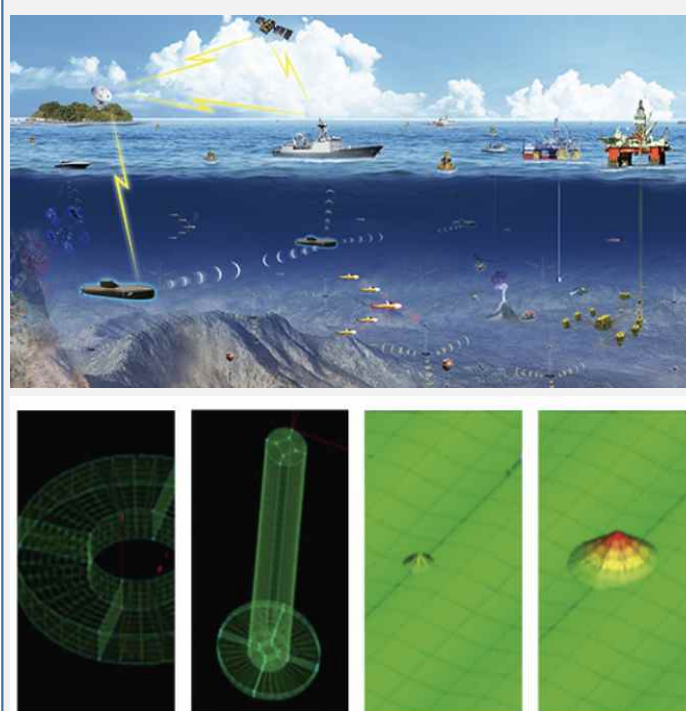
OVERVIEW OF KRISO (MAJOR RESEARCH THEMES)

- Development of advanced maritime equipment and ICT convergence technology

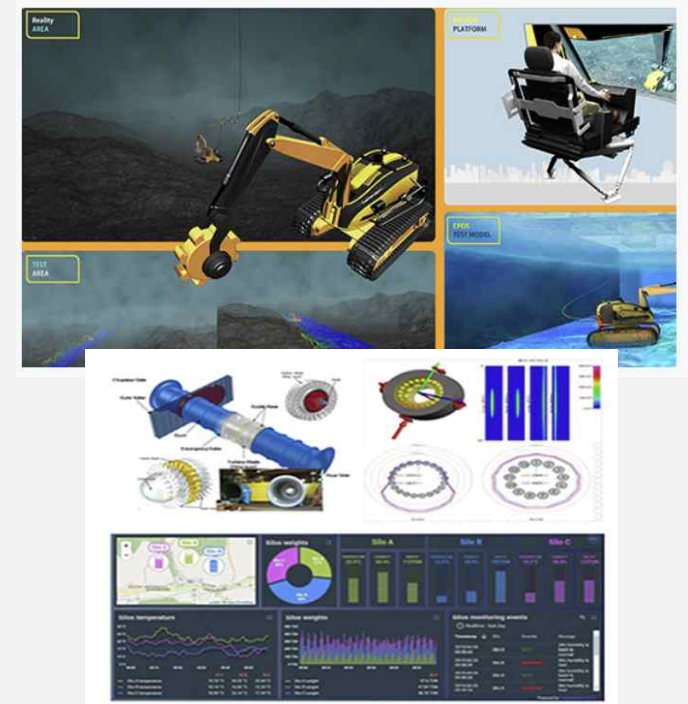
Development of smart maritime equipment and robot technology



Development of smart maritime communications and ocean survey equipment



Development of smart maritime equipment operating technology based on cyber physical system





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OVERVIEW OF KRISO (MAJOR RESEARCH THEMES)

- Development of maritime transportation and maritime accident response technology

Development of smart maritime transportation technology



Development of rapid maritime accident response technology



Development of marine GIS and GNSS technology



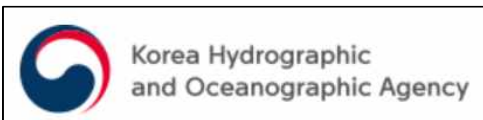


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ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

International Hydrographic Organization

- KHOA S-100 Team



KHOA

Manage S-100 testbed project



KRISO

Support KHOA and lead the project

BLUEMAP
Bluemap

S-100 Tools
KHOA Viewer
Open source code

GREENBLUE
Greenblue

IHO GI Registry

GMT
GMT

ECDIS OEM
Shore based ECDIS
DF ECDIS

Data Production Industry

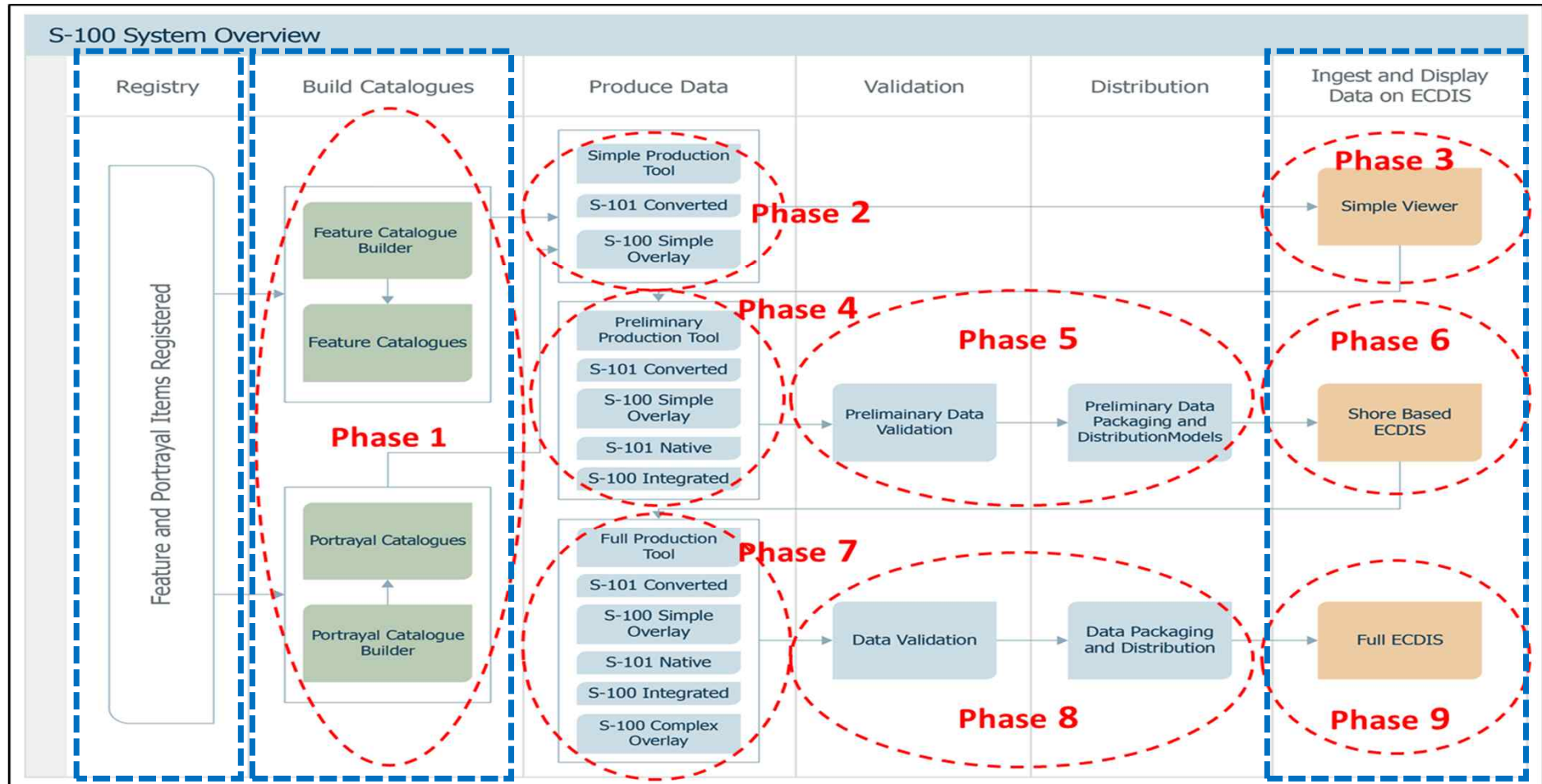
Production of S-1XX TDS



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ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

- S-100 test framework





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ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

• IHO GI Registry

International Hydrographic Organization

No	Name	Camelcase	Definition	Status	Date Accepted
1	(A-4.1) No Passing or Overtaking o...	a4PointNoPassingOrOvertaking...	Prohibition Mark A-4.1: No passing or overtaking by convoys	Valid	2024-05-14
2	Passing or Overtaking of Convoys ...	passingOrOvertakingOfConvoysB...	A specified area designated by appropriate authority, within which pas...	Valid	2024-05-14
3	Current Farm	currentFarm	A collection of collocated devices which harness current, for example t...	Valid	2024-05-14
4	Speed Uncertainty	speedUncertainty	Estimate characterising the accuracy of a speed value, or of the magni...	Valid	2024-05-06
5	X-Shaped	xShaped	Having a shape or a cross-section like the capital letter X.	Valid	2024-05-06
6	Brazilian National Inland Waterwa...	brazilianNationalInlandWaterway...	Navigational aids conform to the Brazilian national inland waterway re...	Valid	2024-04-23
7	(BR) Right Pillar in Passage For Tiet...	brRightPillarInPassageForTietePa...	Regulation mark (BR): Right pillar in passage for Tiete-Parana Waterwa...	Valid	2024-04-23
8	(BR) Left Pillar in Passage For Tiet...	brLeftPillarInPassageForTietePar...	Regulation mark (BR): Left pillar in passage for Tiete-Parana Waterwa...	Valid	2024-04-23
9	(BR) Best Transit Point	brBestTransitPoint	Information mark (BR): Best Transit Point	Valid	2024-04-23
10	(BR) Mandatory Stopping Point For T...	brMandatoryStoppingPointForTiet...	Regulation mark (BR): Mandatory Stopping Point for Tiete-Parana Wat...	Valid	2024-04-23
11	Rescue Service	rescueService	Local search and rescue service.	Valid	2024-04-02

Item ID	Name	Camelcase	Definition	Domain	Status	Date Accepted
755	Surface Current	SurfaceCurrent	A current that does not extend more than a ...	IHO Hydro	Valid	2024-05-15
753	Water Level	WaterLevel	The vertical position of a water surface.	IHO Hydro	Valid	2024-05-15
752	Bridge	Bridge	(1) An elevated structure extending across o...	IHO Hydro	Valid	2024-04-19
722	Wreck	Wreck	The ruined remains of a stranded or sunken ...	IHO Hydro	Valid	2024-03-28
723	Underwater/Awash Rock	UnderwaterAwa...	A concreted mass of stony material or coral ...	IHO Hydro	Valid	2024-03-28
724	Obstruction	Obstruction	In marine navigation, anything that hinders ...	IHO Hydro	Valid	2024-03-28
725	Dredged Area	DredgedArea	An area of the bottom of a body of water wh...	IHO Hydro	Valid	2024-03-28
726	Marine Farm/Culture	MarineFarmCult...	An assemblage of cages, nets, rafts and float...	IHO Hydro	Valid	2024-03-28
727	Cable Area	CableArea	An area which contains one or more submar...	IHO Hydro	Valid	2024-03-28
728	Pipeline Submarine/On Land	PipelineSubmar...	A connected set of pipes for conveying liqui...	IHO Hydro	Valid	2024-03-28
729	Offshore Production Area	OffshoreProduct...	An area at sea within which there are produ...	IHO Hydro	Valid	2024-03-28

xmlID	Preview	Name	Definition	Item Type	Status	Date Accepted
1615	9	SAFCON99	Contour label - ___+ 9_	symbol	Valid	2024-04-02
1614	8	SAFCON98	Contour label - ___+ 8_	symbol	Valid	2024-04-02
1613	7	SAFCON97	Contour label - ___+ 7_	symbol	Valid	2024-04-02
1612	6	SAFCON96	Contour label - ___+ 6_	symbol	Valid	2024-04-02
1628	WRECK505	WRECK505	dangerous wreck, depth unknown	symbol	Valid	2023-11-30
1627	UWTR0C03	UWTR0C03	dangerous underwater rock of uncertain depth	symbol	Valid	2023-11-30
1626	SPRING02	SPRING02	spring	symbol	Valid	2023-11-30
1625	OBSTRN03	OBSTRN03	obstruction which covers and uncovers	symbol	Valid	2023-11-30



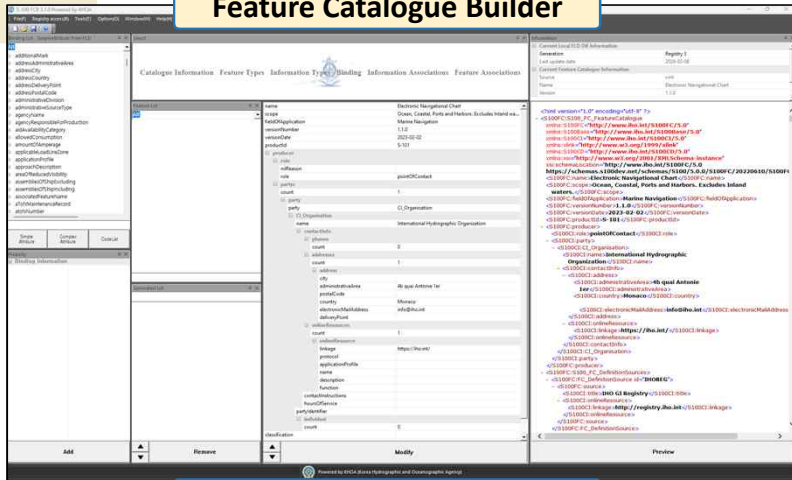
IHO

ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

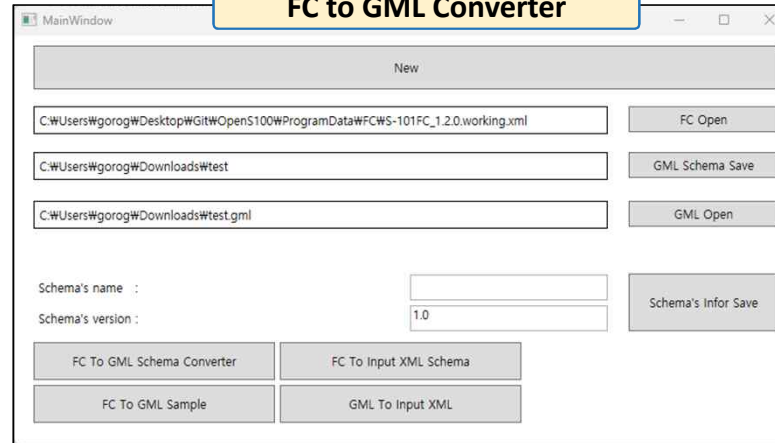
International
Hydrographic
Organization

• S-100 Tools

Feature Catalogue Builder

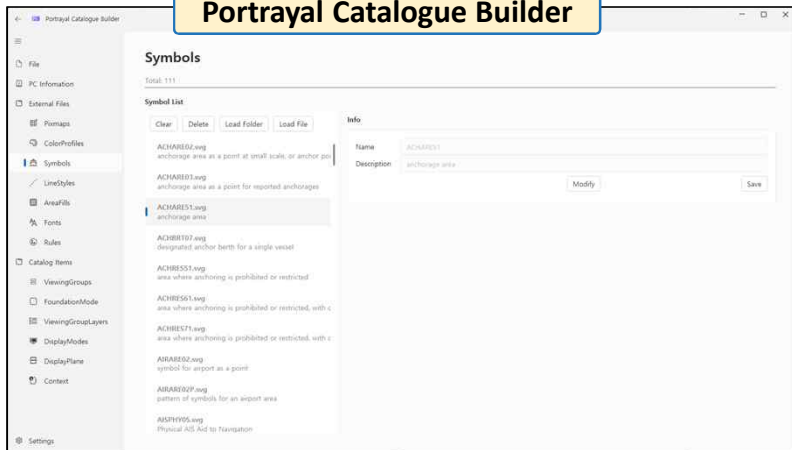


FC to GML Converter

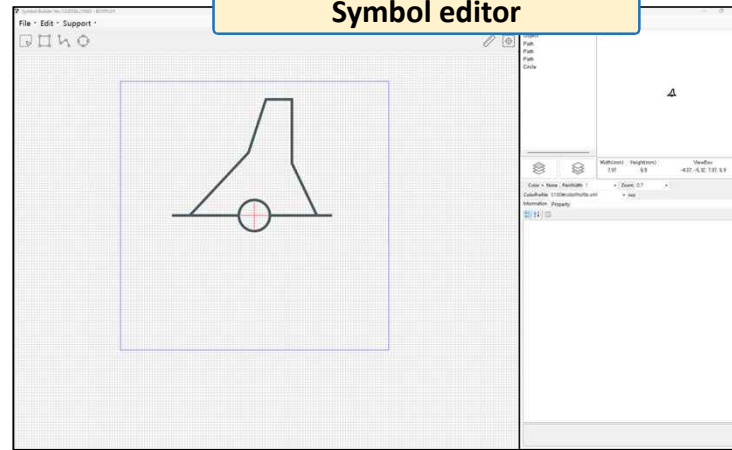


DCEG Composer

Portrayal Catalogue Builder



Symbol editor



IC Editor

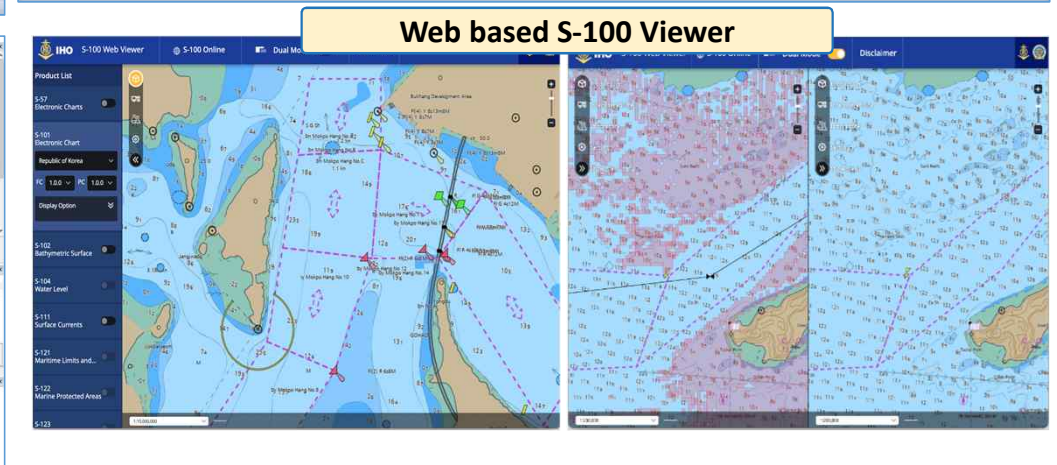
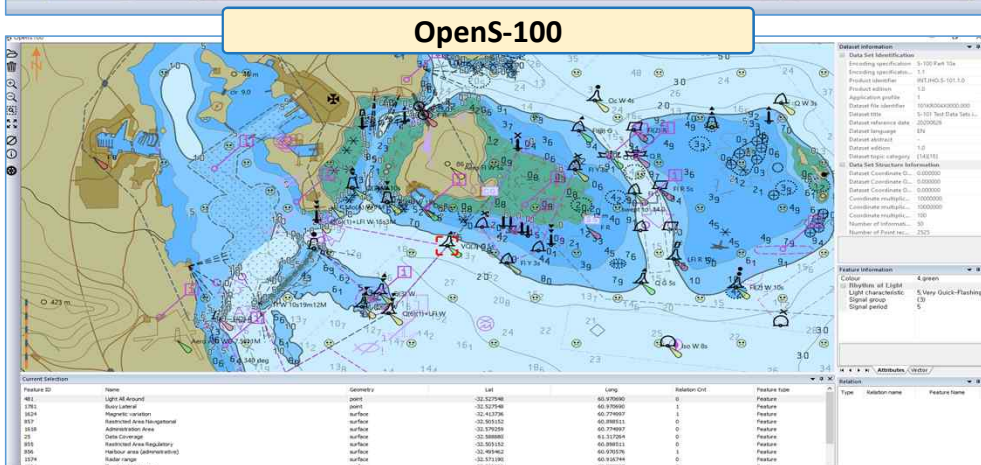
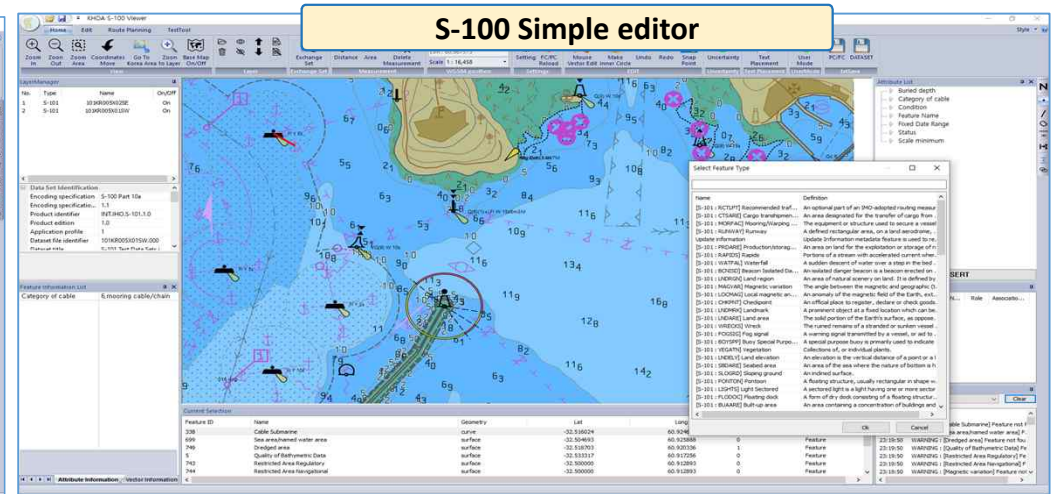
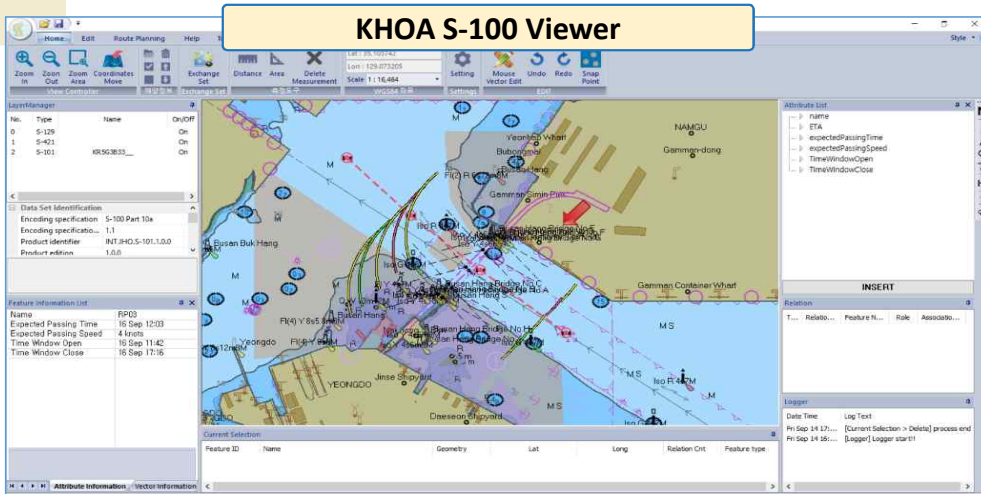


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ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

• S-100 Tools for KHOA

International Hydrographic Organization



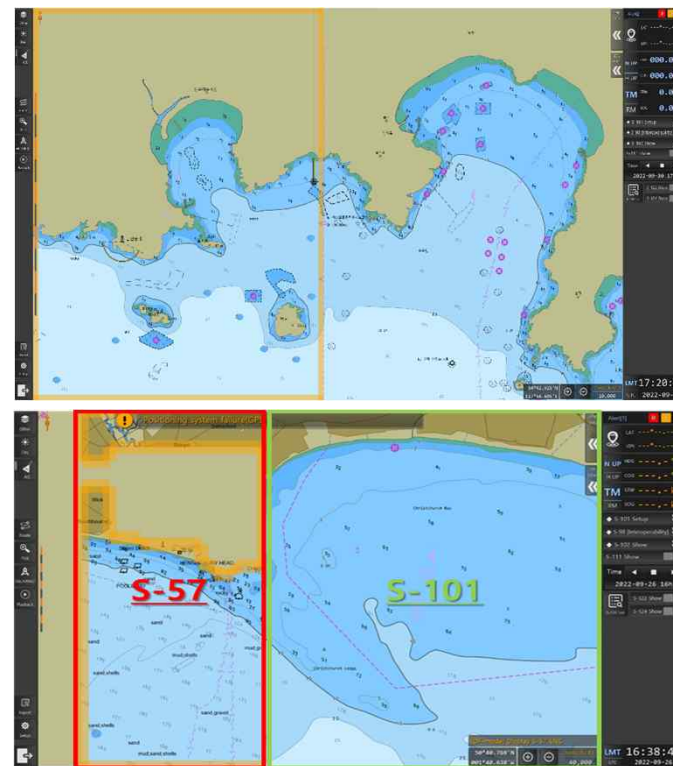
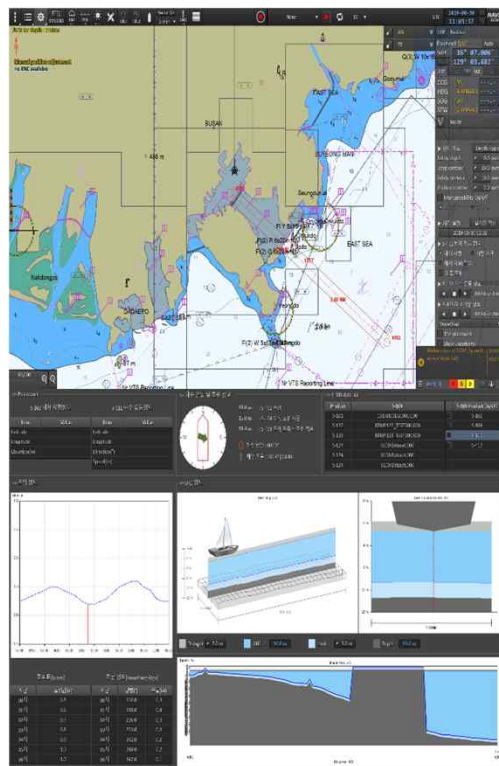


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ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

International
Hydrographic
Organization

- Shore based ECDIS / DF mode





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ACTIVITIES IN SUPPORT OF THE S-100 IMPLEMENTATION

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Organization

- S-100 Testing Center

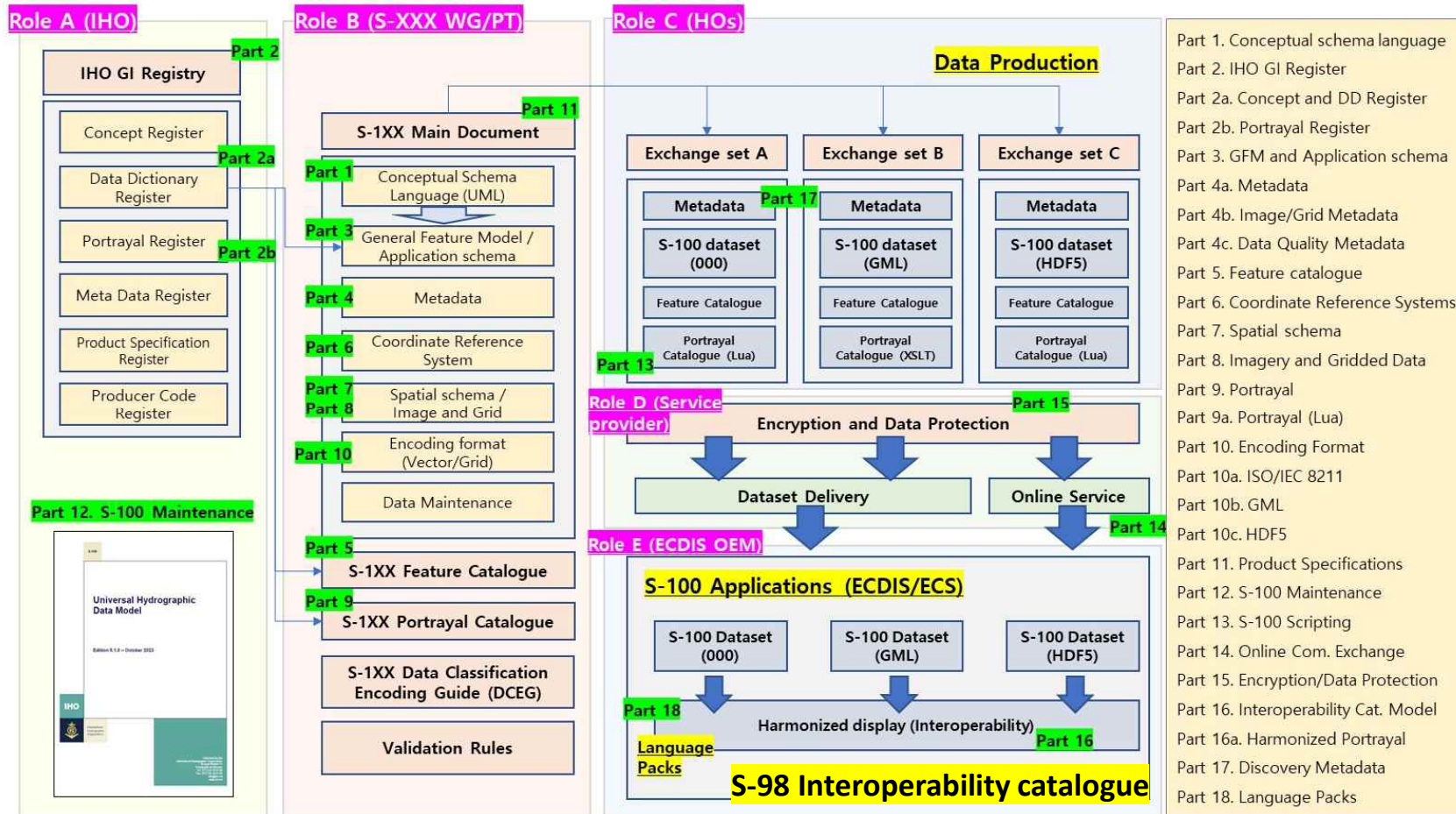




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CONCERNS IN S-100 IMPLEMENTATION

- How S-100 and critical framework are operated



Phase 1 (Route Monitoring)

- S-101 ENC, S-102 Bathy
- S-104 Water Level
- S-111 Surface current
- S-124 Nav warning
- S-129 UKC Management

Phase 2 (Route Planning)

- S-122 MPA, S-123 MRS
- S-125 Marine Aton
- S-126 MPE, S-127 MTM
- S-131 MHI
- S-411 ICE, S-412 Weather

Role F (Port State Control)

- S-128 CNP
- Up-to-dateness check

Role G (ECDIS type approval)

Testing with S-164

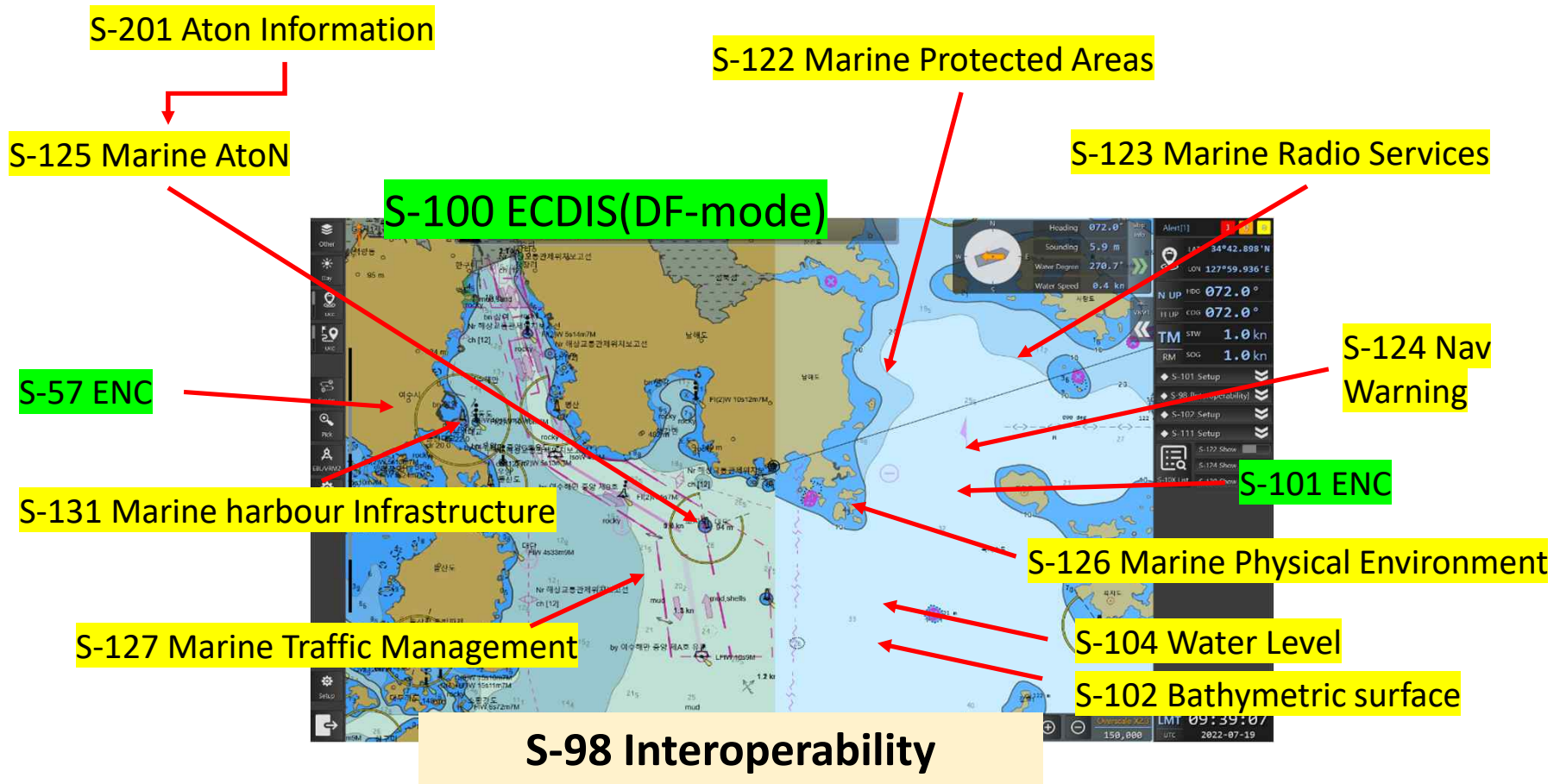


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CONCERNS IN S-100 IMPLEMENTATION

International Hydrographic Organization

• S-100 ECDIS (DF-Mode)





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CONCERNS IN S-100 IMPLEMENTATION

International Hydrographic Organization

- New concepts and functions

Full Machine Readability

IHO GI Registry

Concept register

Data Dictionary register

Portrayal register

Product spec. register

Product spec.

Feature Cat.

Portrayal Cat.

Alarm/Indication

S-100 Data

WLA

Interoperability



Meta data

Up-to-dateness check by S-128

Report(S-128)

Report Name : Electronic Navigational Charts(ENC) Update Status Report

Vessel Name :

Identifier :

Update Reference Date (from S-128) :

Date of Report : 2022-09-13

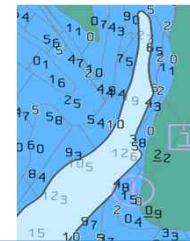
Content :

Chart Status	Count
Total	602
Up to Date	446/602
Not Up to Date	156/602
Withdrawn	0/602
Unknown	0/602

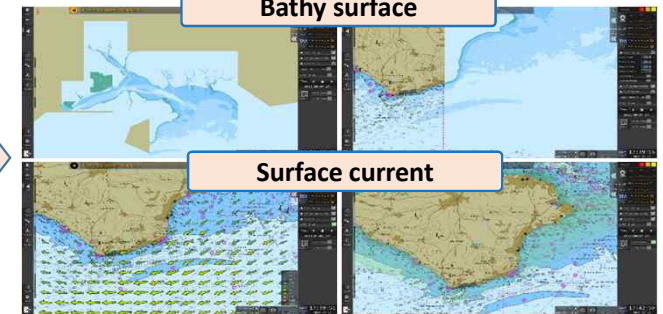
Dataset Status Summary

Products	Num	Dataset Name	Edition	Update	Issue Date	Status
ALL	1	[S-57] KR1F0000	18	20	20220107	Up to Date
S-57	2	[S-57] KR2F4000	17	6	20220107	Up to Date
S-101	3	[S-57] KR3F4D00	9	0	20220107	Up to Date
S-102	4	[S-57] KR3F4H00	25	2	20220107	Up to Date
S-104	5	[S-57] KR4F4H10	20	5	20220107	Up to Date
S-111	6	[S-57] KR4F4H20	36	2	20220107	Up to Date
S-122	7	[S-57] KR4F4H30	22	21	20220107	Up to Date
S-123	8	[S-57] KR4F4H40	22	13	20220107	Up to Date
S-124	9	[S-57] KR5F4H21	24	2	20220107	Up to Date
S-127	10	[S-57] KR5F4H22	29	4	20220107	Up to Date
	11	[S-57] KR5F4H23	24	4	20220107	Up to Date
	12	[S-57] KR5F4H24	21	2	20220107	Up to Date

Improved Safety using dynamic data



Depth Contour (3m, 5m, 10m, ...)



Bathy surface

Surface current

Route Optimization and Just in Time



**IHO**

CONCERNS IN S-100 IMPLEMENTATION

• S-100 Readiness Levels (S-97)

Required Product Specification component	Level 1 V1.0.0	Level 2 V1 – 1.0.0	Level 3 > V2.0.0	Level 4 > V2.0.0	Level 5 > V2.0.0
Main Document (Defines the relevant parts of S-100 that are required for the Product Specification)	X	X	X	X	X
A Default Encoding	X	X	X	X	X
S-100 Compliant Feature Catalogue	X (draft)	X (updated)	X (final)	X	X
Data Classification and Encoding Guide	X (draft)	X	X (final)	X	X
S-100 Compliant Portrayal Catalogue NOTE: Not every Specification will need a Portrayal Catalogue – this should be determined as part of the development process and stakeholder feedback.		X	X	X	X
Data Quality Checks		X	X	X	X
Test Data Sets		X	X	X	X
Data Validation (and test datasets)		X	X	X	X
Exchange Catalogue		X	X	X	X
Encryption / Digital Signatures			X	X	X
Interoperability			X (draft)*	X (tested)*	X*
Alerts and Indications				X*	X*
Operational data				X*	X*

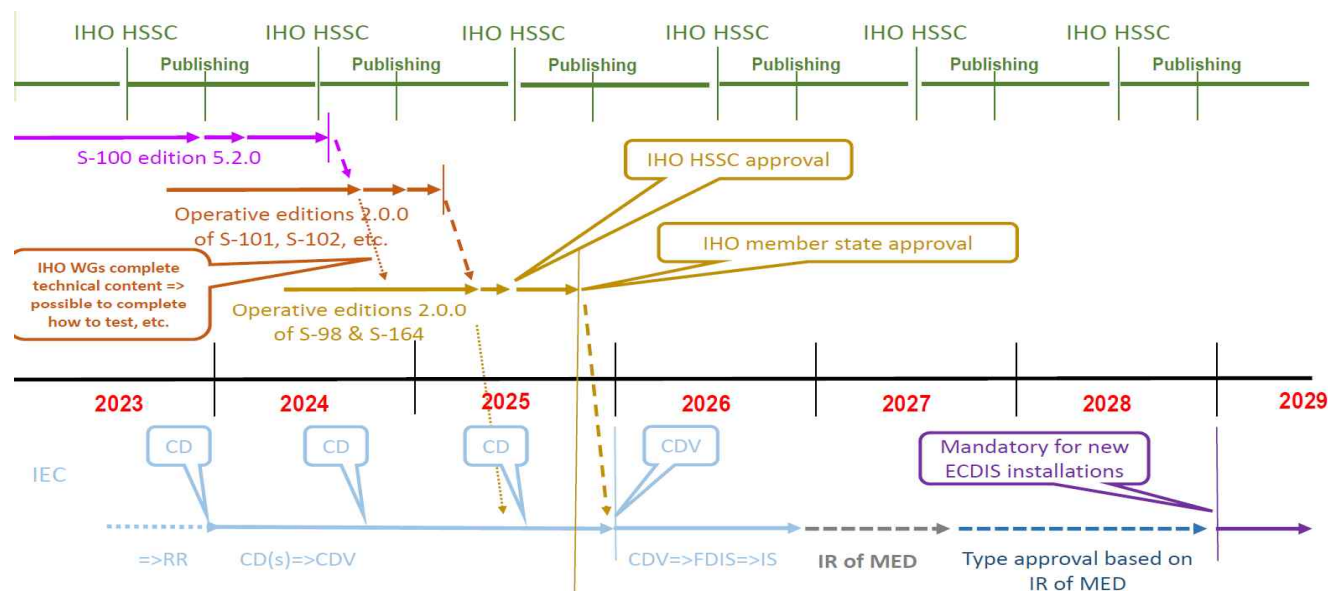


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CONCERNS IN S-100 IMPLEMENTATION

- S-421 was included in ECDIS Performance Standard
- Phase 1 products Ed 2.0.0 will be published in 2024
- Phase 2 products Ed 2.0.0 are supposed to be published
- S-98 Ed. 2.0.0 will be published in 2025
- S-164 Ed. 2.0.0 will be published in 2025

IEC 61174 ED5, TIMELINE





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CONCERNS IN S-100 IMPLEMENTATION

International
Hydrographic
Organization

- S-100 introduced new concepts and technologies
- New concepts and technologies must perform tests repeatedly and precisely before implementing S-100
- Due to the adjustment of the publication schedule for the operational version of S-98/S-164, the preparation schedule for the industry has become tighter.
- In order to successfully prepare for S-100 implementation, application and sharing of the testing version should be actively promoted rather than waiting until the development of the operational version is completed.



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RECOMMENDATIONS

International
Hydrographic
Organization

• Testing topics

**S-164 TDS
(All Testing
Scenario)**

**WLA (Water
Level
Adjustment)**

**Interoperability
(S-98 Lv 1, Lv 2)**

**Phase 1
products
FC/PC/TDS**

**Phase 2
products
FC/PC/TDS**

**S-100 Part 15
Protection
schemes**

**Up-to-dateness
Check by S-128**

**Multi Language
Support**

**Improved Pick
Report**

**IEC S-421 Route
Exchange**

IEC SECOM

**Alert &
Indication**

**Dual Fuel
Mode**

**Exchange set
Model
(Metadata)**



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RECOMMENDATIONS

International
Hydrographic
Organization

- **Materials/TDS/Resources for Testing**

GI Registry

IHO Github

S-100
Resources

S-100
Schema

S-164 TDS

Open
source

NOAA
S-102

Open
online
platform

IC-ENC
PDT
Licence

UKHO TDS

SHOM TDS

SECOM
Library



IHO RECOMMENDATIONS

International
Hydrographic
Organization

- Testing activities
 - KHOA S-100 testbed project (Sea trial, Usability/Economic impact)
 - NIWC Shore based ECDIS
 - IHO-Singapore lab (Malacca strait, Italian Navy - Vespucci)
 - UK-France Sea trial
 - S-100 Validation Tools



IHO RECOMMENDATIONS

International
Hydrographic
Organization

- The HSSC is invited to:
 - Consider to include S-421/SECOM in the S-100 implementation roadmap
 - Organize a special correspondence group responsible for S-100 testing and demonstration.
 - Develop a testing schedule considering the S-98, S-164 operational version and IEC 61174 5th edition development.
 - Type approval testing by S-164 TDS, Shore test and Sea Trial
 - Test to investigate the views and opinions of mariners
 - Usability test of S-100 data
 - Provide S-100 TDS by IMO member states to ensure smooth progress of S-100 testing
 - Develop a tutorial or guidance on how to implement S-100 from an industry perspective
 - Hold a VTC or workshop to share and discuss S-100 test results with the industry.