Thematic Block 2

S-100 - next level of digitalization of hydrographic information

Ms Julia Powell

Mr Pierre-Yves Dupuy

Ms Izzy KIM

Mr Richard Doherty

3rd IHO ASSEMBLY
2-5 MAY 2023
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Precision Marine Navigation

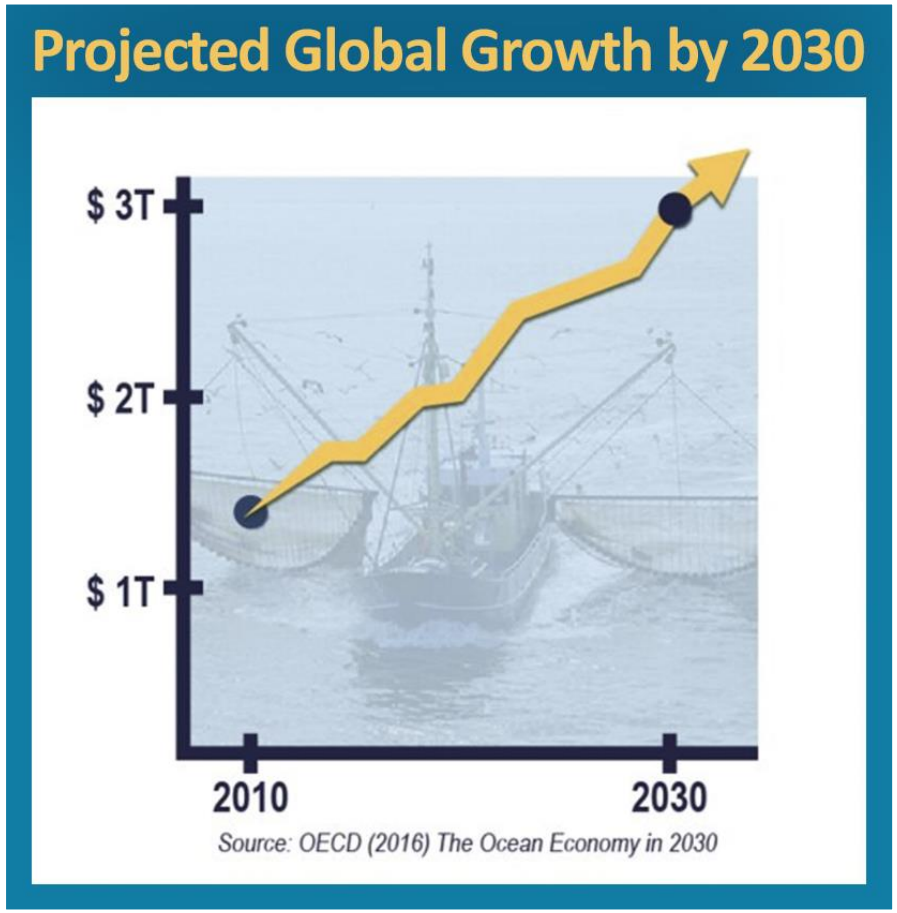
Information Infrastructure for the New Blue Economy

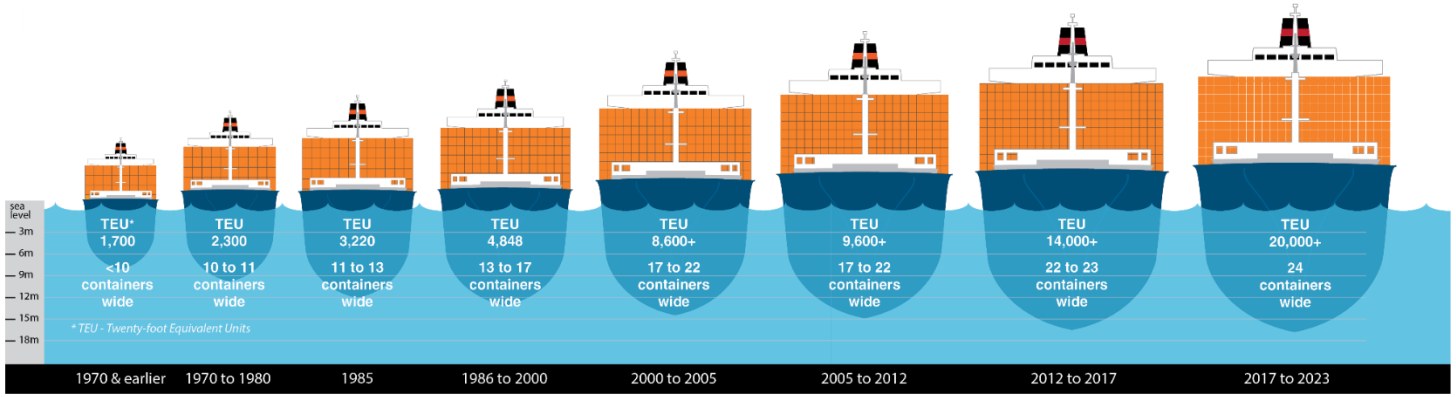
IHO International Hydrographic Organization

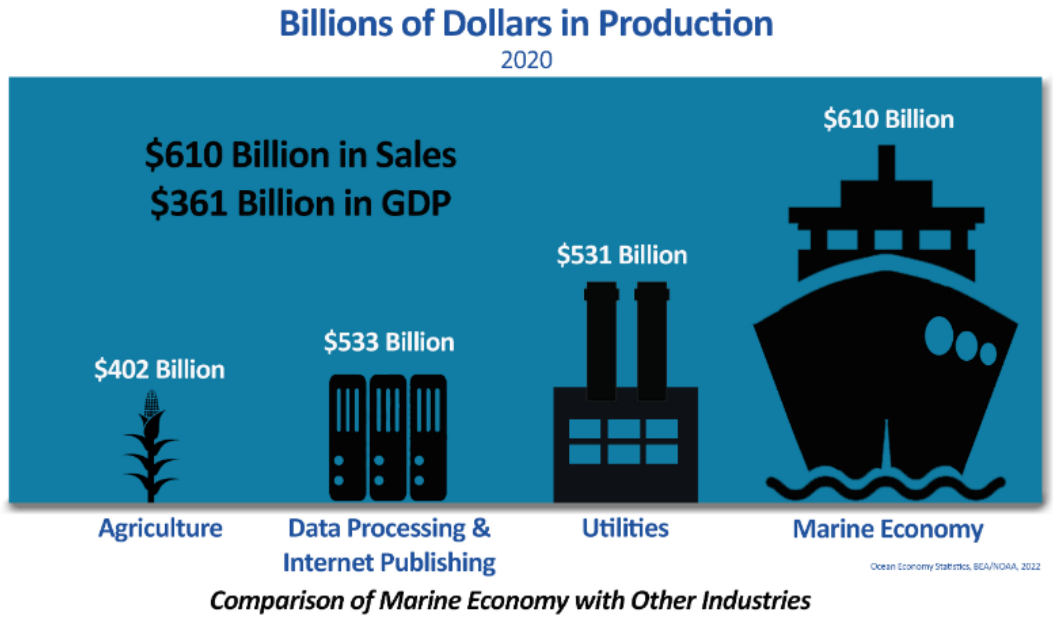
What is precision marine navigation?

…the ability of a vessel to safely and efficiently navigate and operate in close proximity to the seafloor, bridges, narrow channels, or other marine hazards.

The Maritime Economy





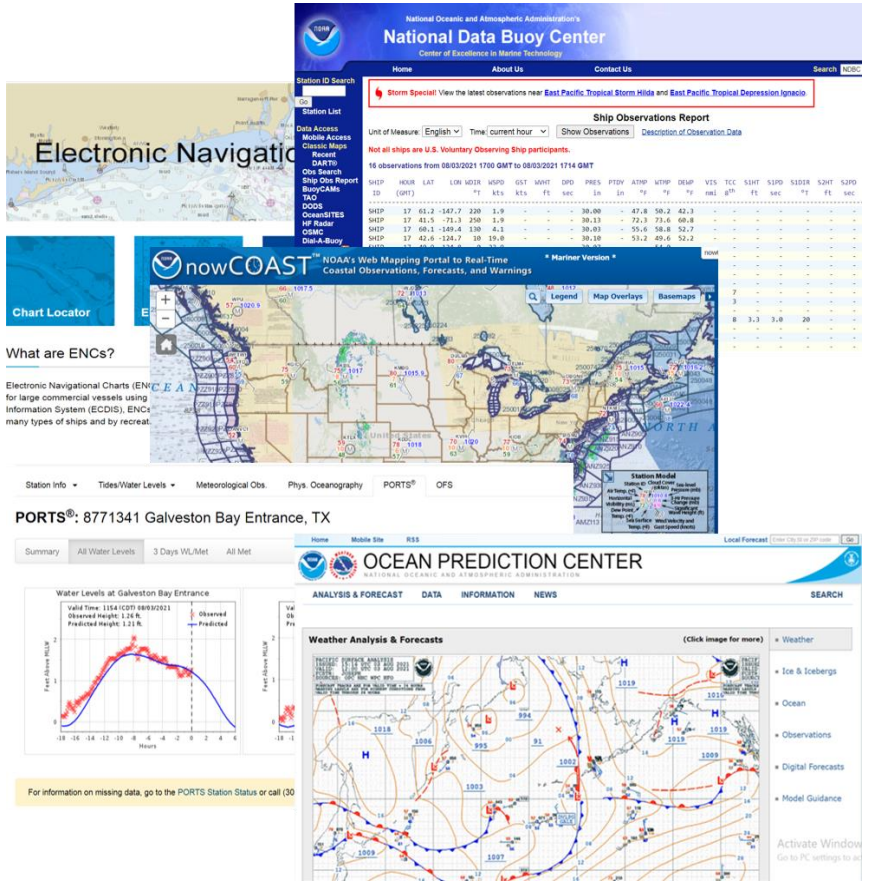


Comparison of Marine Economy with Other Industries

Navigation Data Challenges

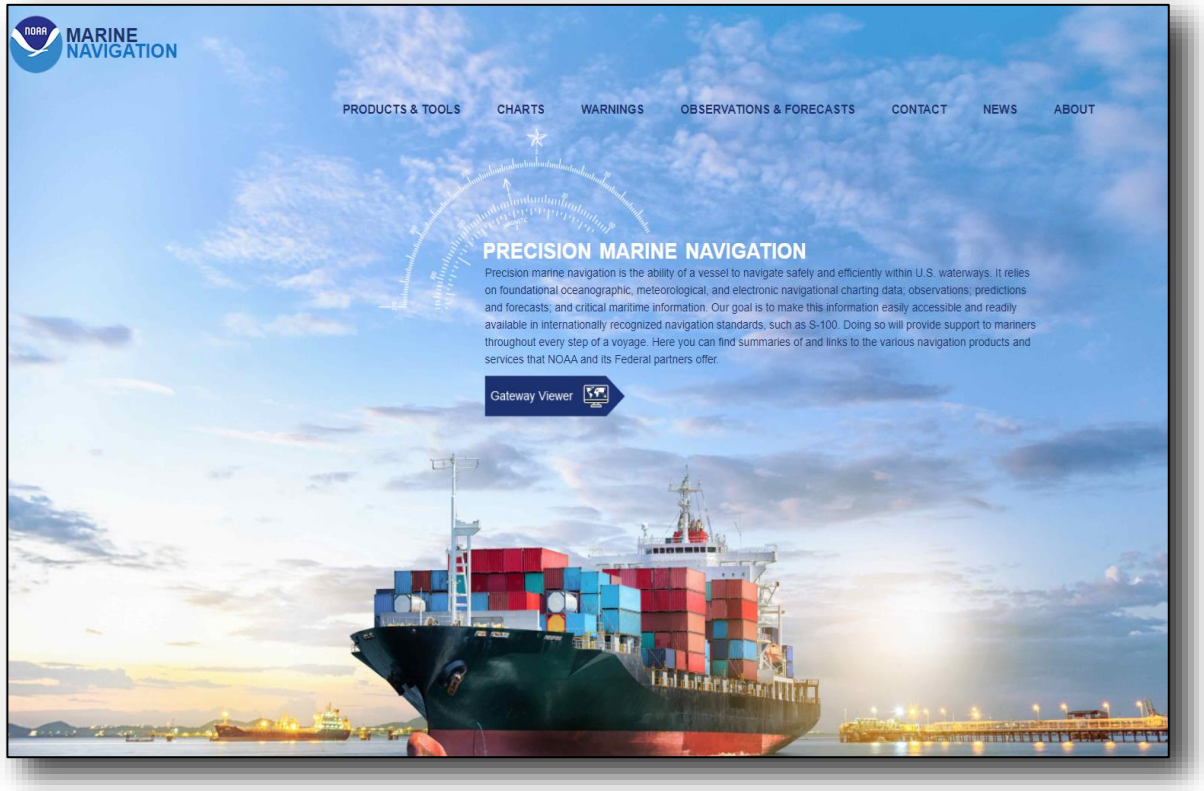
Difficult to access and process NOAA's navigation data, due to:

- Multiple devices and systems required to access the data
- Datasets spread across various websites and data servers
- Datasets are encoded in different formats that are not navigation standards



Precision Marine Navigation Program

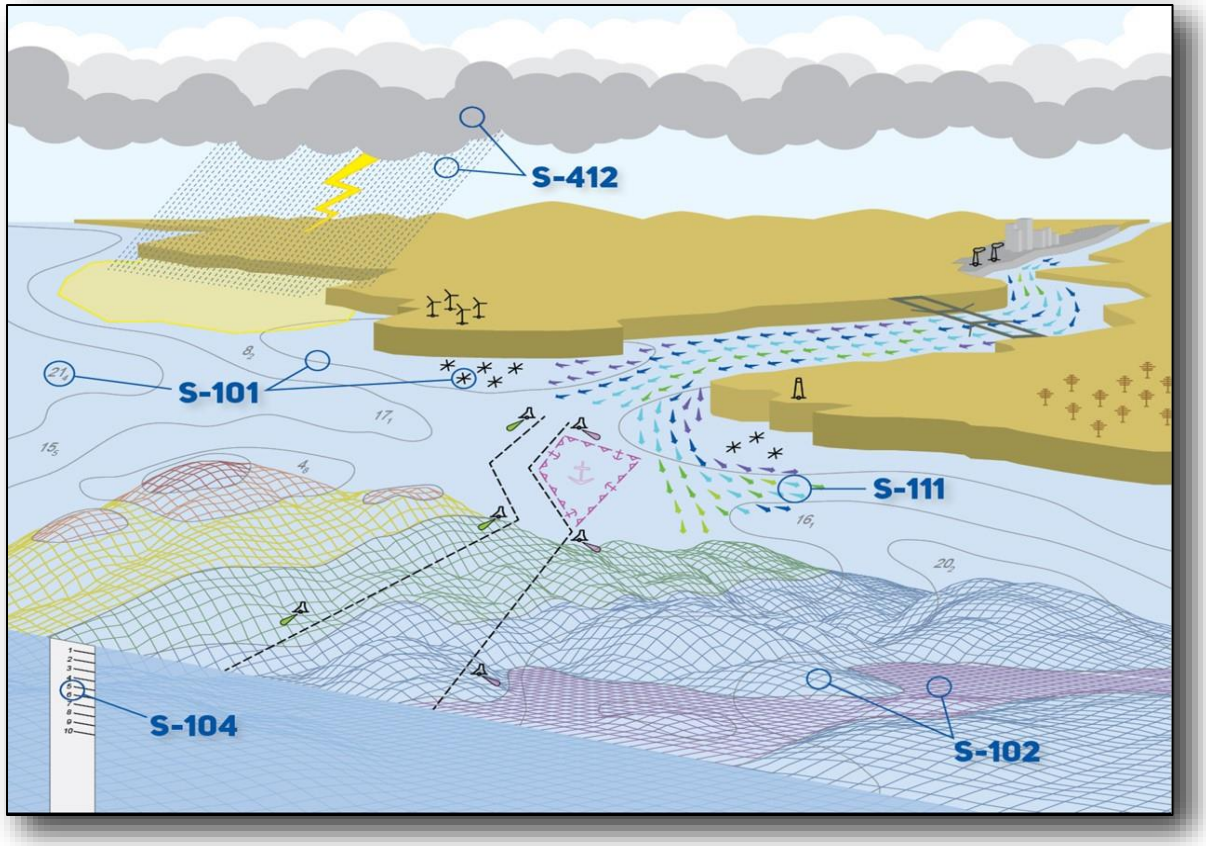
- Leveraging International Standards (S-100)
- Precision Marine Navigation Data and Dissemination Services
- Machine to Machine capability
- Marinenavigation.noaa.gov Website



The S-100 Data Framework

S-100 Data Products

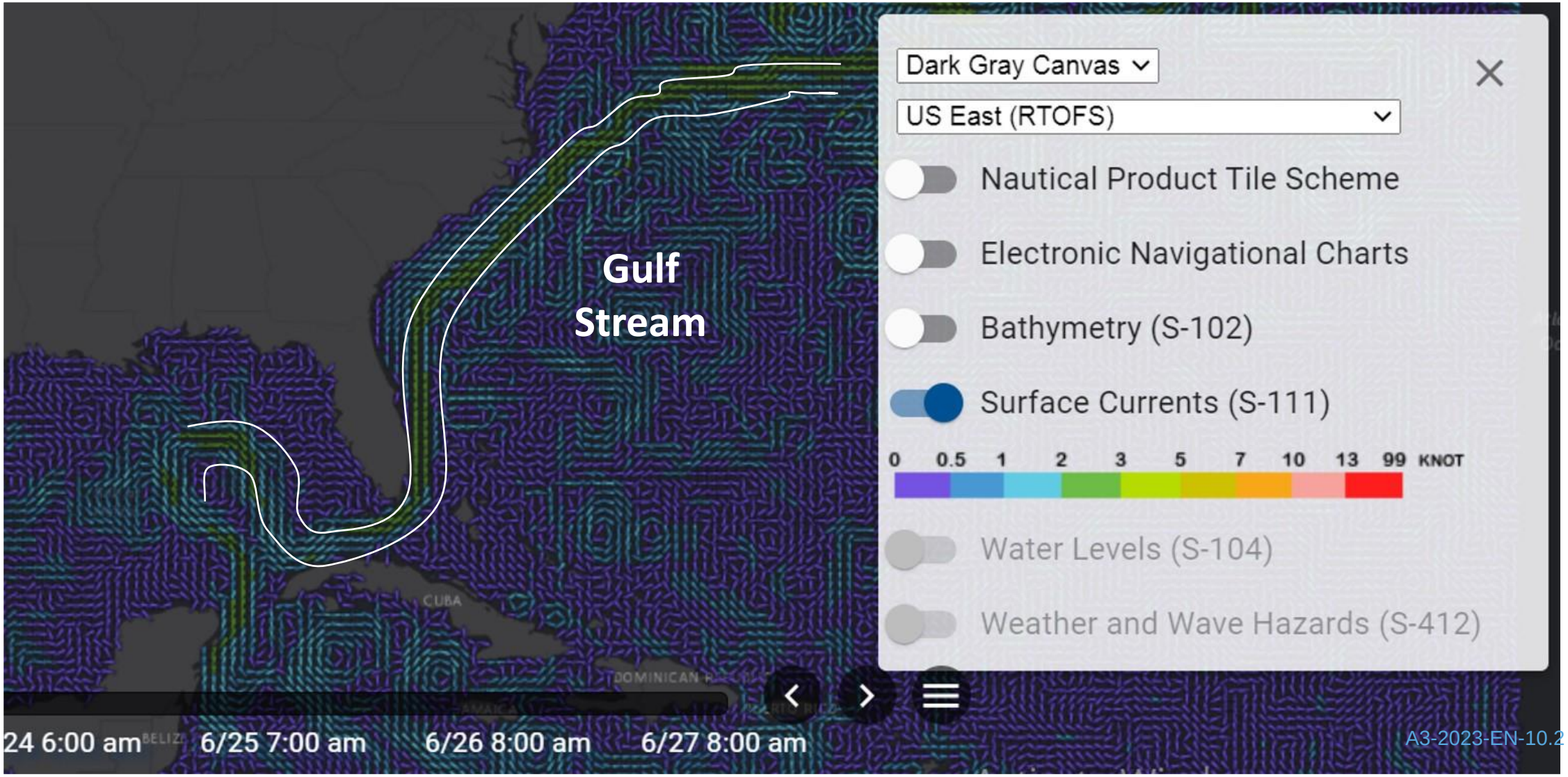
- **S-101**: Electronic Navigational Charts
- **S-102:** Bathymetric Surface
- **S-104:** Water Level Information
- **S-111:** Surface Currents
- **S-412:** Weather Overlays



S-102 Prototype Data

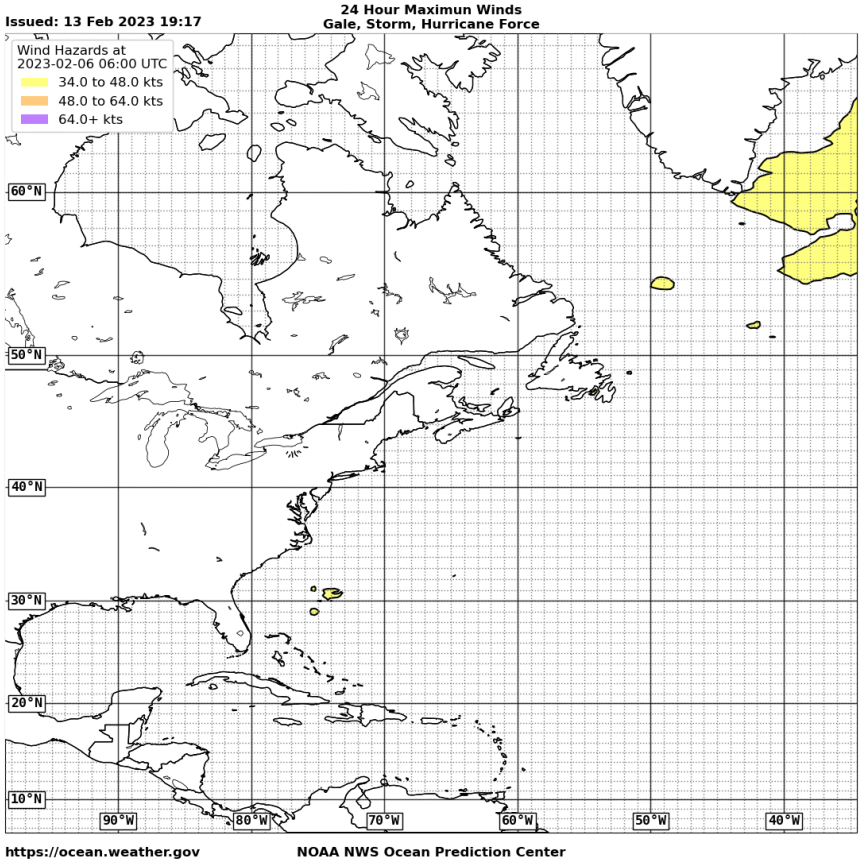
- Downloadable via AWS
- Full Discovery Metadata
  - New York Harbor
  - Los Angeles

S-111 Surface Currents

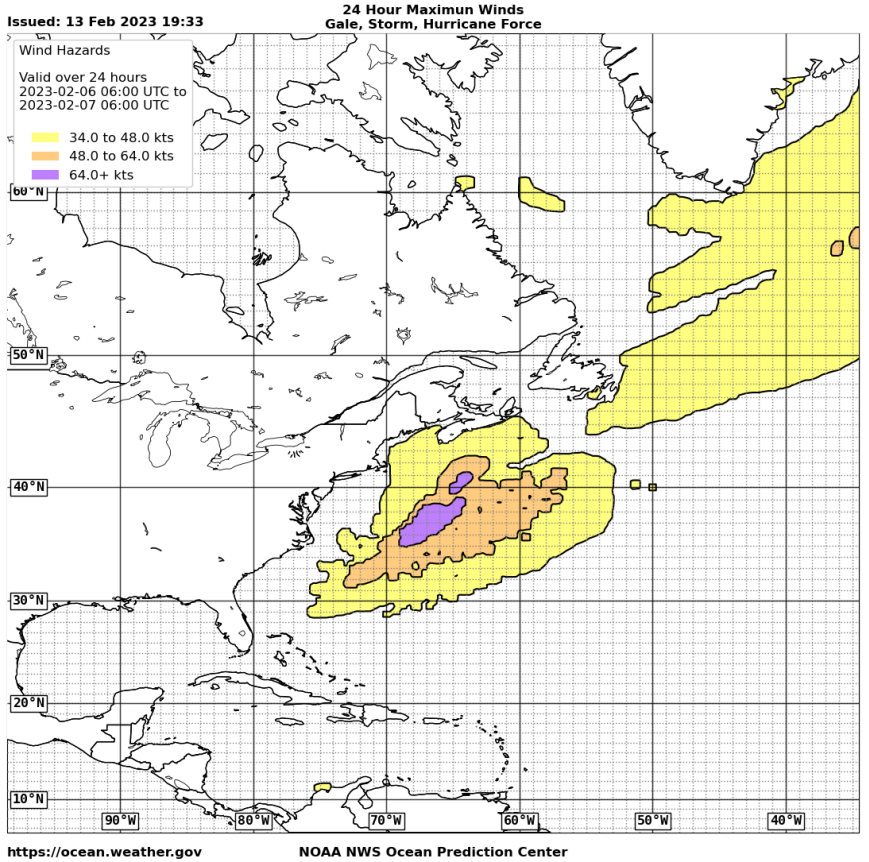


S-412 Wave and Wind Warnings

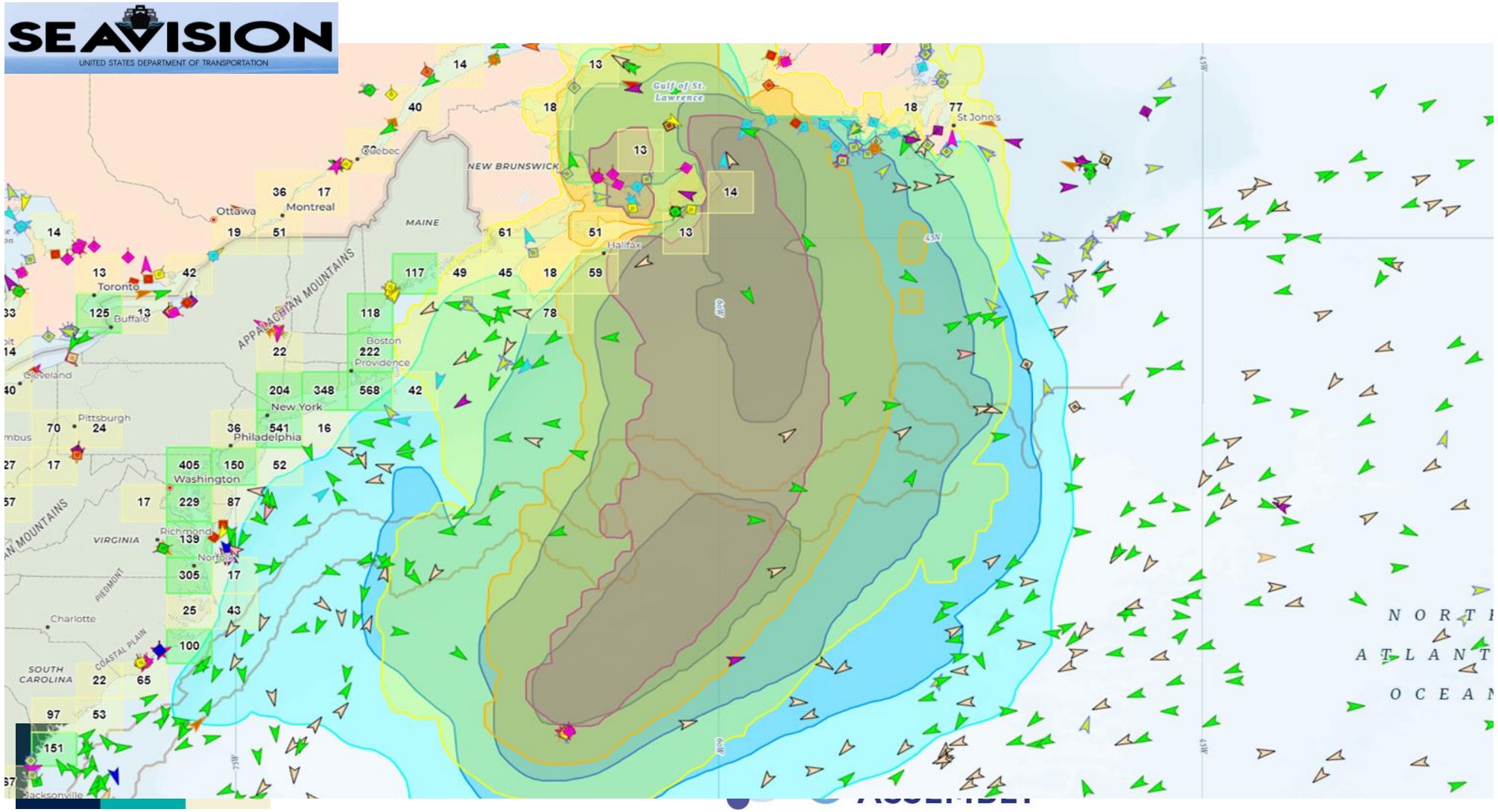
Components (Hourly)



24 Hour Composite



Wind and Wave Warning Polygons For Hurricane Fiona Sep 23rd 1530Z



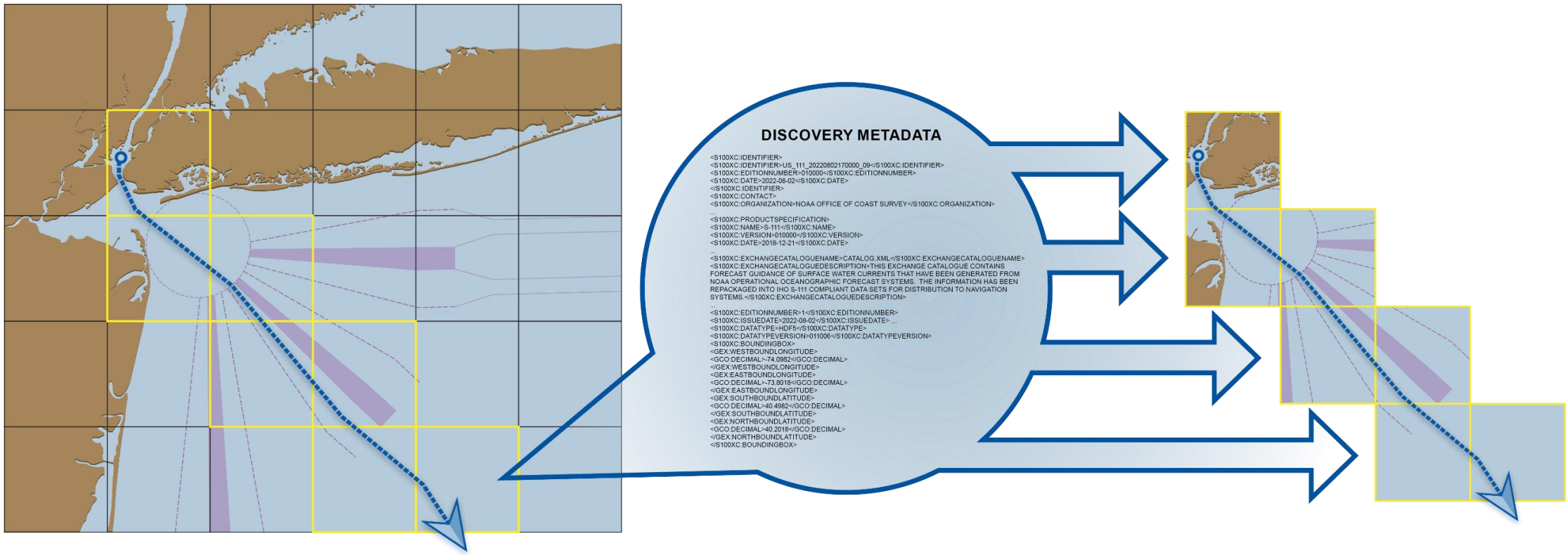
Wind Warnings:

- Gale Force
- Storm Force
- Hurricane Force

Wave Warnings:

- 4-6 M
- 6-9 M
- 9-14 M
- 14+ M

S-100 and the Power of Discovery Metadata

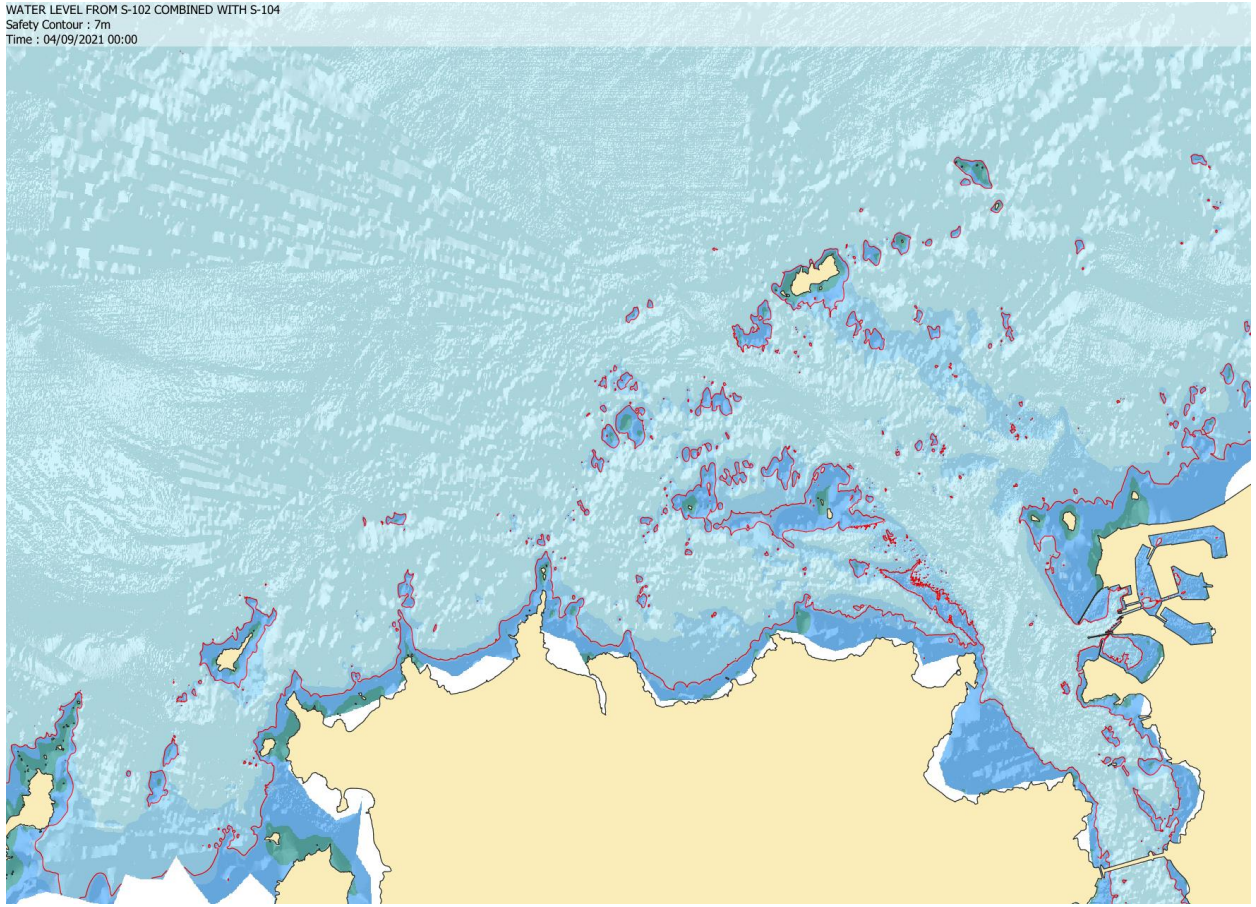


S-100 Dual Fuel ECDIS

Functionality and S-98

- S-101 ENC is ALWAYS the base navigation layer
  - S-101 will take display priority over S-57
- If S-102 is available
  - Ability to replace the bathymetric information on an S-101 ENC for the calculation of the user defined safety contour
- S-104 Water Level adjustment can be used with either S-101 or S-102
- S-57 WILL NOT be able to leverage S-102 or other S-10X products defined in S-98

User Defined Safety Contour (WLA)



Safety Contour 7m. The safety contour changes are based on S-102 bathymetry and Water Level Adjustment (WLA), using S-104, over a period of 21 hours.

Animation Courtesy of SHOM

Benefits of Precision Marine Navigation

Making the marine navigation data more accessible can enhance the decision-making process, leading to increased efficiency…

- Optimizing routes for fuel savings and reduced CO2 emissions
- Reducing lightering offshore (Safety issue)
- Reducing port wait times

…and improved safety

- Reduced collisions, allisions, and groundings
- Avoiding hazardous weather conditions

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Le projet français PING
The French PING project

Production et diffusion d'avertissements de navigation S-124

Production and dissemination of S-124 navigational warnings

IHO International Hydrographic Organization

Le projet de plateforme nationale de l'information nautique (PING)

The nautical information platform project

Plateforme nationale web pour collecter, partager et diffuser des informations nautiques /A *web national platform for collecting, sharing and disseminating nautical information:*

- **Avertissements de navigation :** production et diffusion / ***Navigational warnings:*** *production and dissemination*
- **Géo-règlements:** production de règlementation par les autorités ***/ Geo-regulation:*** *production of regulations produced by authorities*

Une phase de démonstration en 2016-2017 utilisant le démonstrateur du Danish Maritime Authority / *A demonstration phase in 2016-2017 reusing a demonstrator of the Danish Maritime Authority.*

Développement de la plateforme opérationnelle lancé en 2020 avec des financements européens / *Development of the operational platform launched in 2020 with European Union funds*

Principe fondamental: la numérisation des informations nautiques

Fundamental principle: the digitization of nautical information

Instruction du gouvernement français (20 avril 2020) / *French Government's directive (20 April 2020):*

“L’information nautique doit être numérisée pour **faciliter sa diffusion et son intégration à des systèmes clients, comme les systèmes de navigation**. Les informations nautiques doivent être diffusées selon les standards et les recommandations d’interopératibilité, comme ceux de l’OHI, dans le cadre du Service Maritime d’Avertissements de Navigation.”

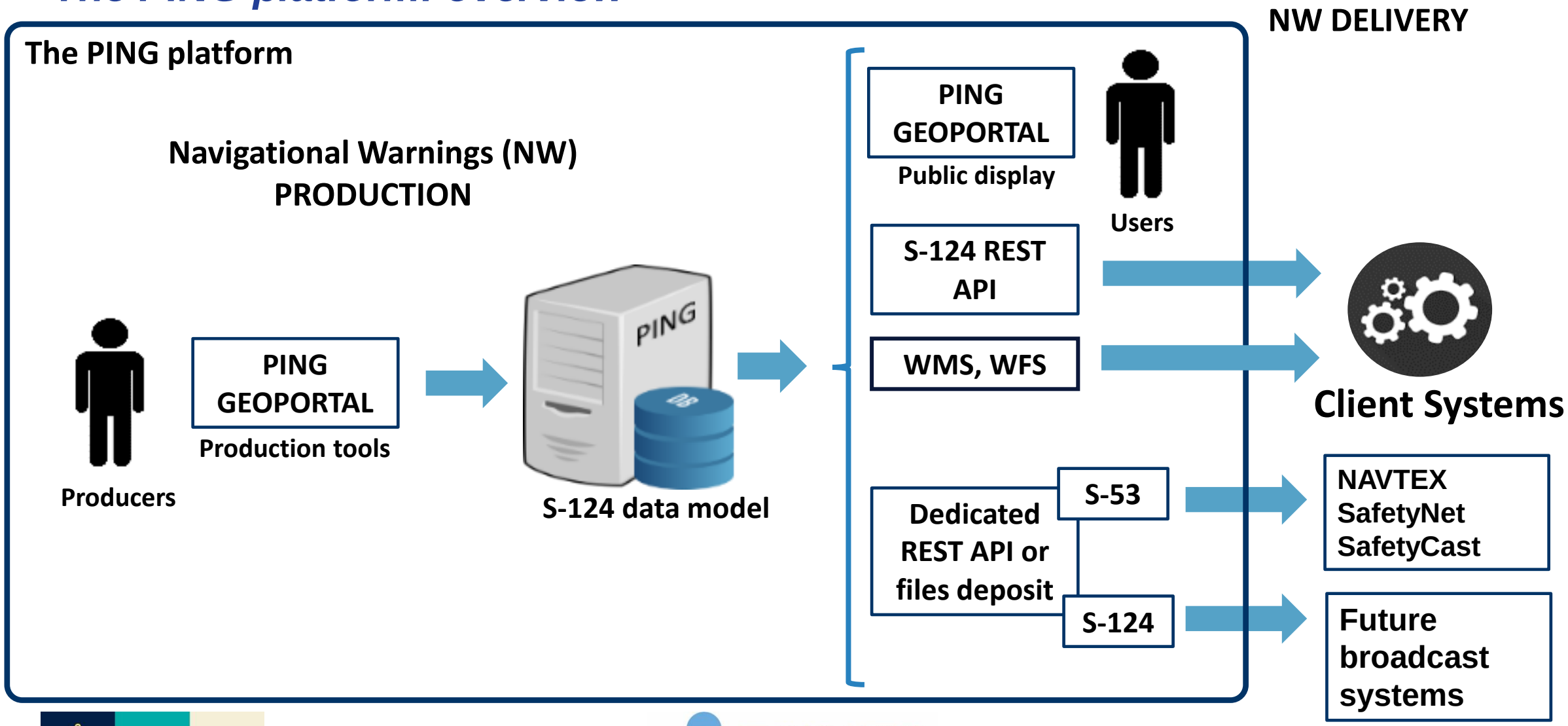
*“Nautical information shall be digitised in order **to facilitate their larger diffusion and integration into client systems, such as ships’ navigation systems.** Nautical information data are supplied following applicable interoperability standards and recommendations, such as those from the IHO, in the framework of the World Wide Navigational Warning Service”*

- Création d’une plateforme nationale des informations nautiques (PING)

  Creation of the national nautical information platform (PING)

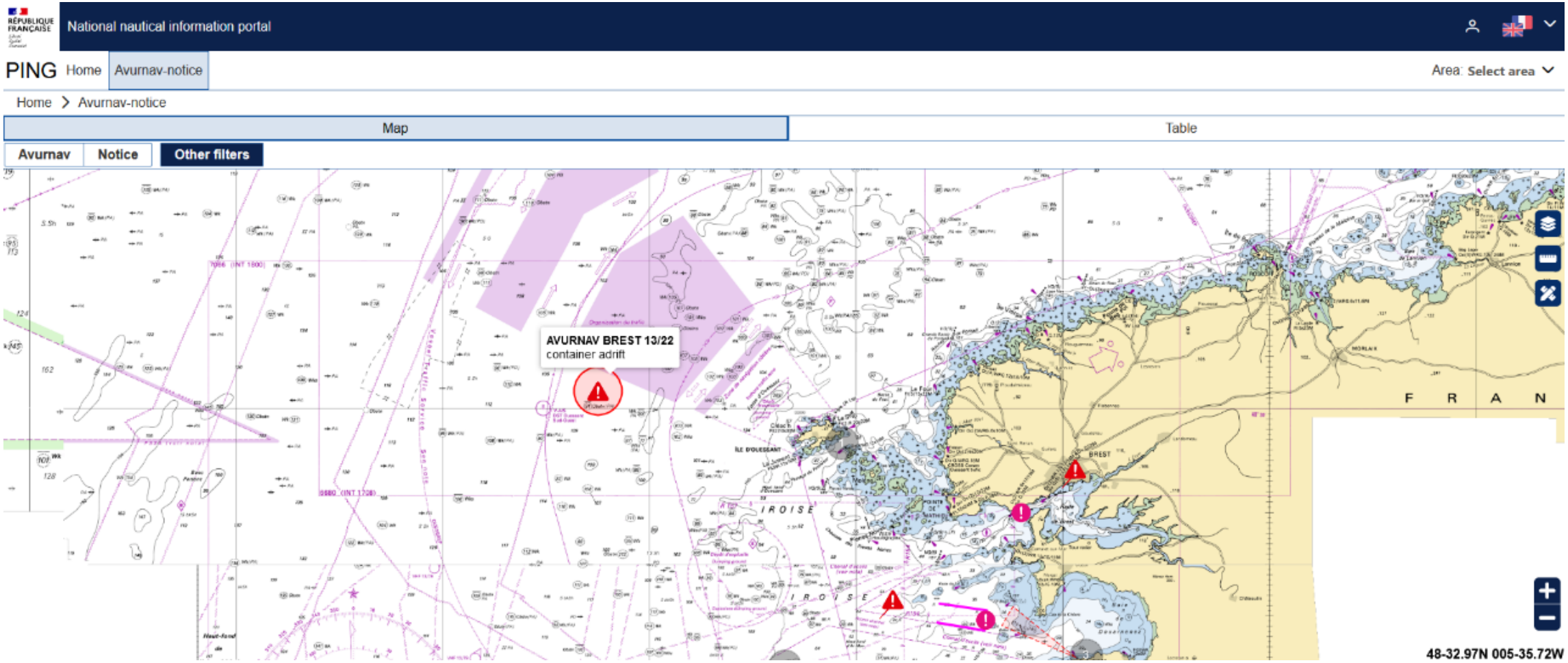
La plateforme PING: schéma d'ensemble

The PING platform: overview



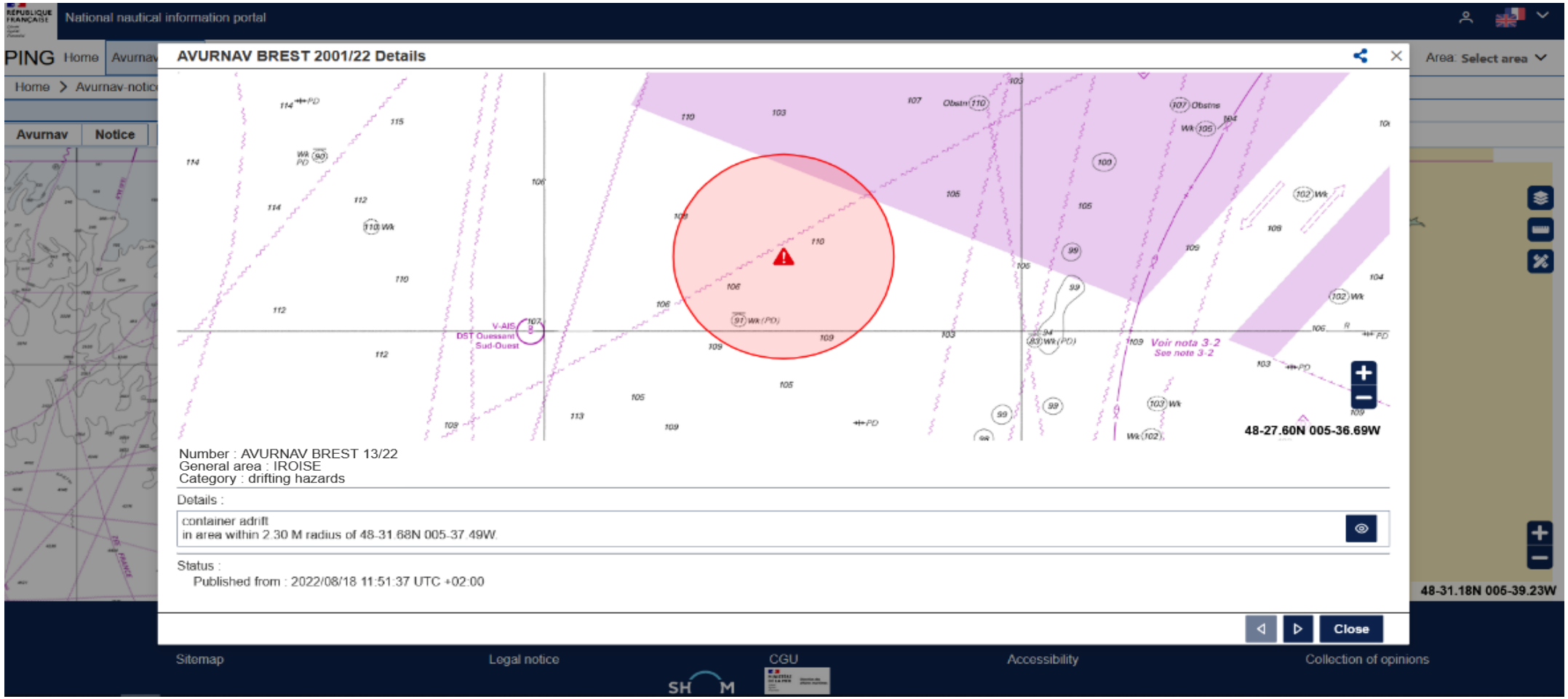
VISUALISATION D'AVIS AUX NAVIGATEURS S-124

Display of S-124 Navigational Warnings



VISUALISATION D'AVIS AUX NAVIGATEURS S-124

Display of S-124 Navigational Warnings



Essais de production S-124 avec des partenaires étrangers

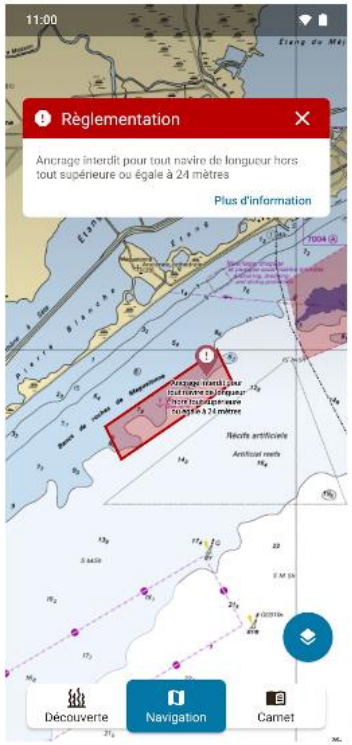
S-124 production trials with foreign partners

Portugal France Italy Croatia Spain

Nav&Co: API nationale exploitant PING

Nav&Co: national API using PING

L'application gouvernementale gratuite Nav&Co mettra à disposition les informations nautiques S-124 de PING en plus des informations de description et de protection de l'environnement marin /*The free government's Nav&Co application will distribute S-124 PING's nautical information in addition to the marine environment description and protection information*



Développements en cours et à venir

Ongoing and further developments

PING sera déployée dans les eaux françaises à partir de mi-2023
PING will be deployed operationally in French waters from mid-summer 2023

La plateforme PING est prévue d'être disponible en source ouverte
The PING platform is planned to be available in open source

Utiliser le standard de liaison sécurisée SECOM de l'IEC sera étudié
Using the IEC SECOM secure connection standard is considered

IEC 63173-2

Edition 1.0 2022-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Maritime navigation and radiocommunication equipment and systems – Data interfaces – Part 2: Secure communication between ship and shore (SECOM)

Matériels et systèmes de navigation et de radiocommunication maritimes – Interfaces de données – Partie 2: Communications sécurisées entre le navire et la terre (SECOM)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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S-100 ECDIS testbed & Interoperability

Next level of digitalization of hydrographic information

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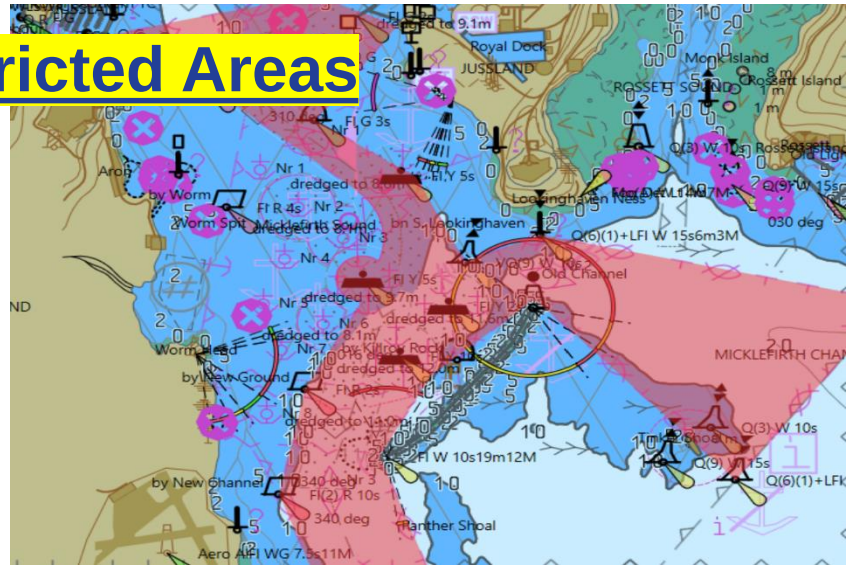
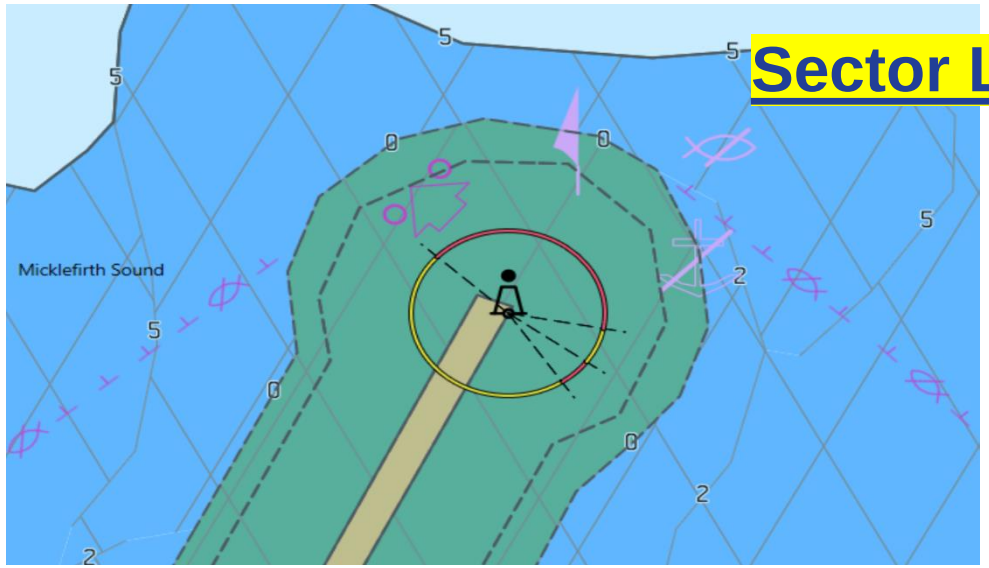
Feature improvement in S-101

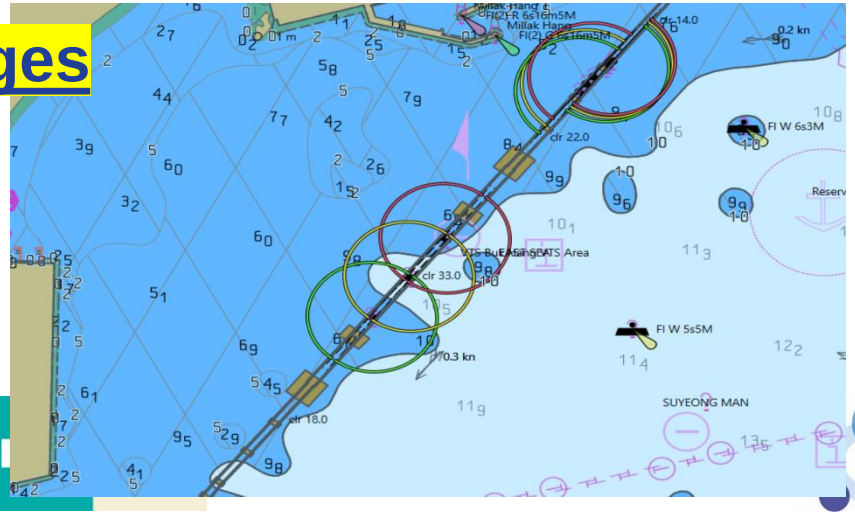
Restricted Areas



Sector Lights



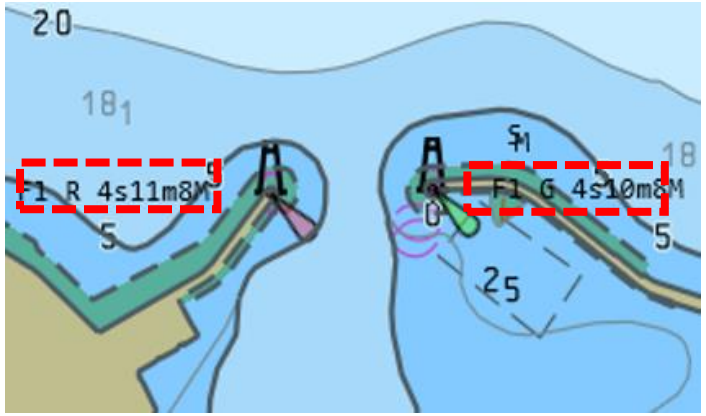
Bridges



Traffic Separation Scheme

Feature improvement in S-101

Display Mode: Head Up
Text Placement: off



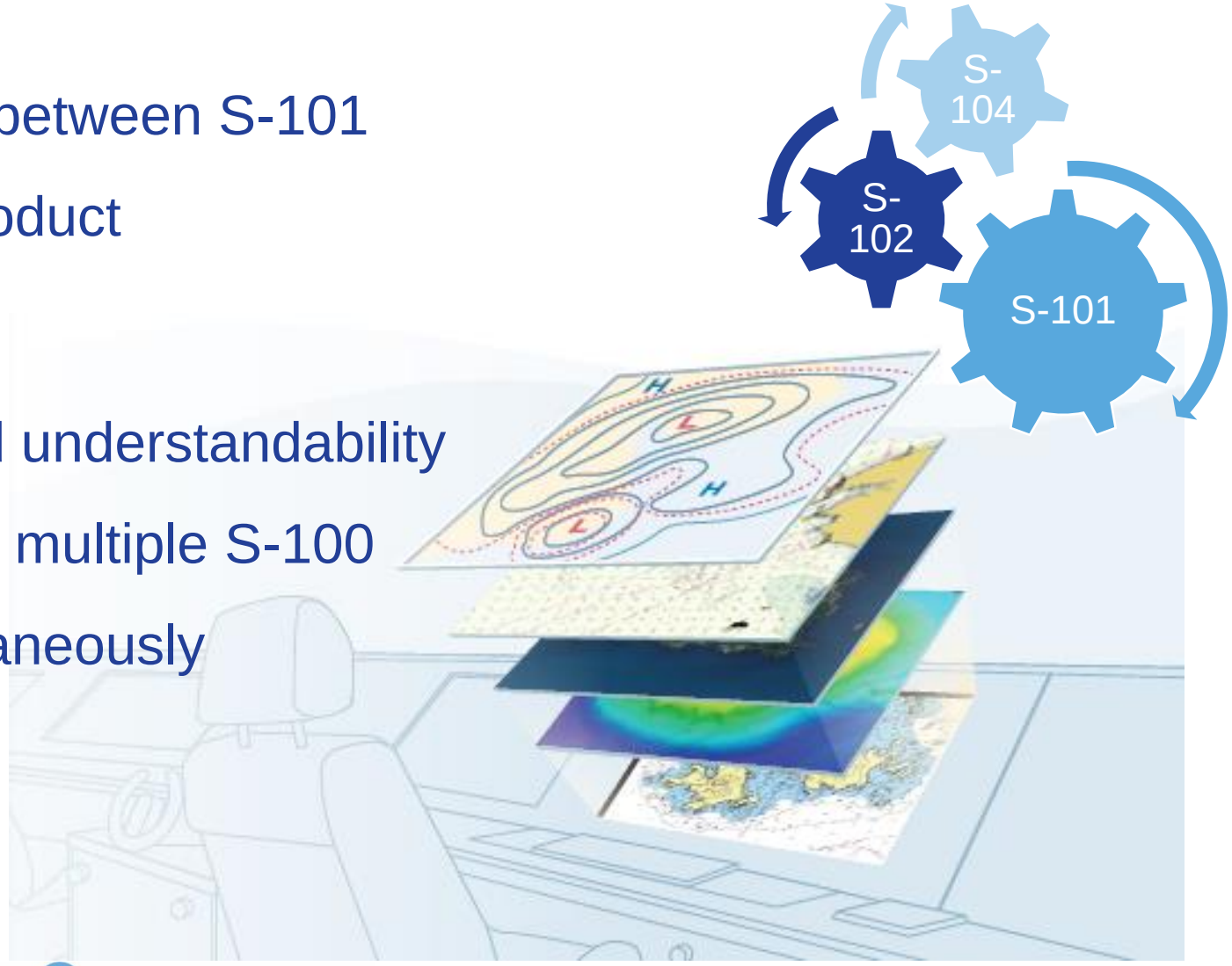
Display Mode: Head Up
Text Placement: on

Text Placement

Information association

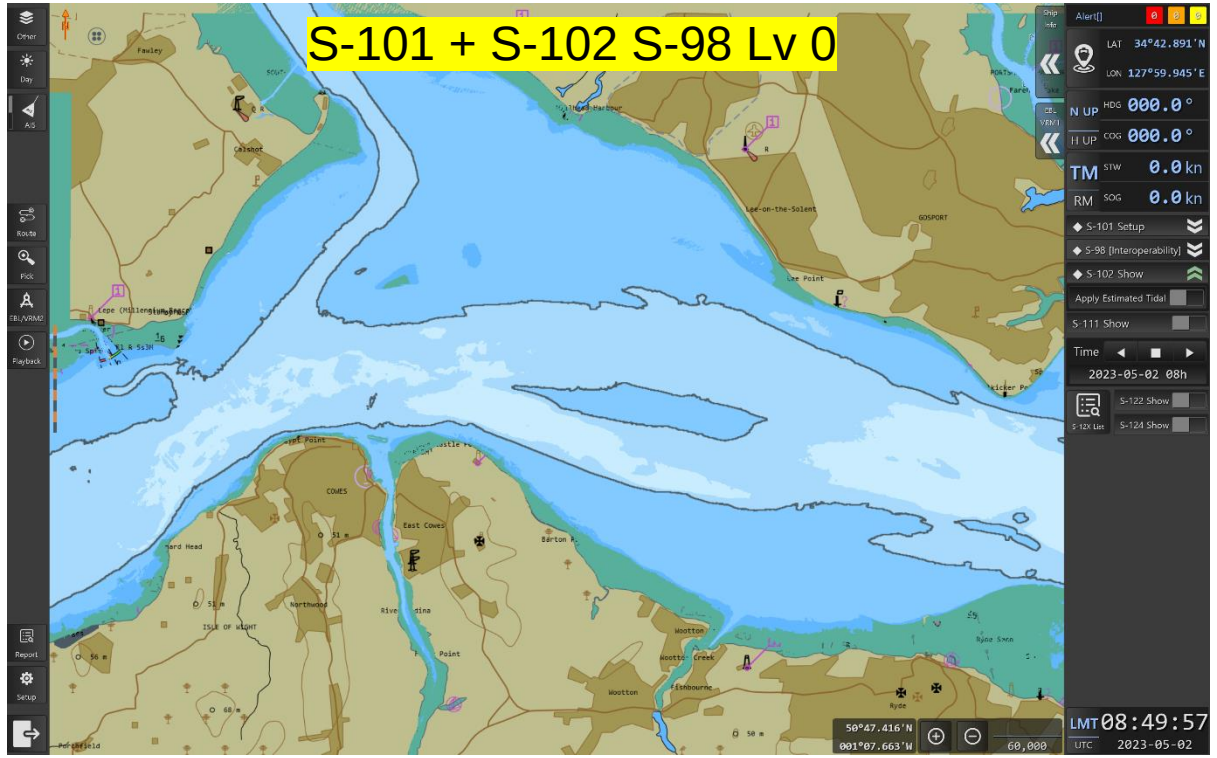
S-98 provides a clear navigation picture to the mariner

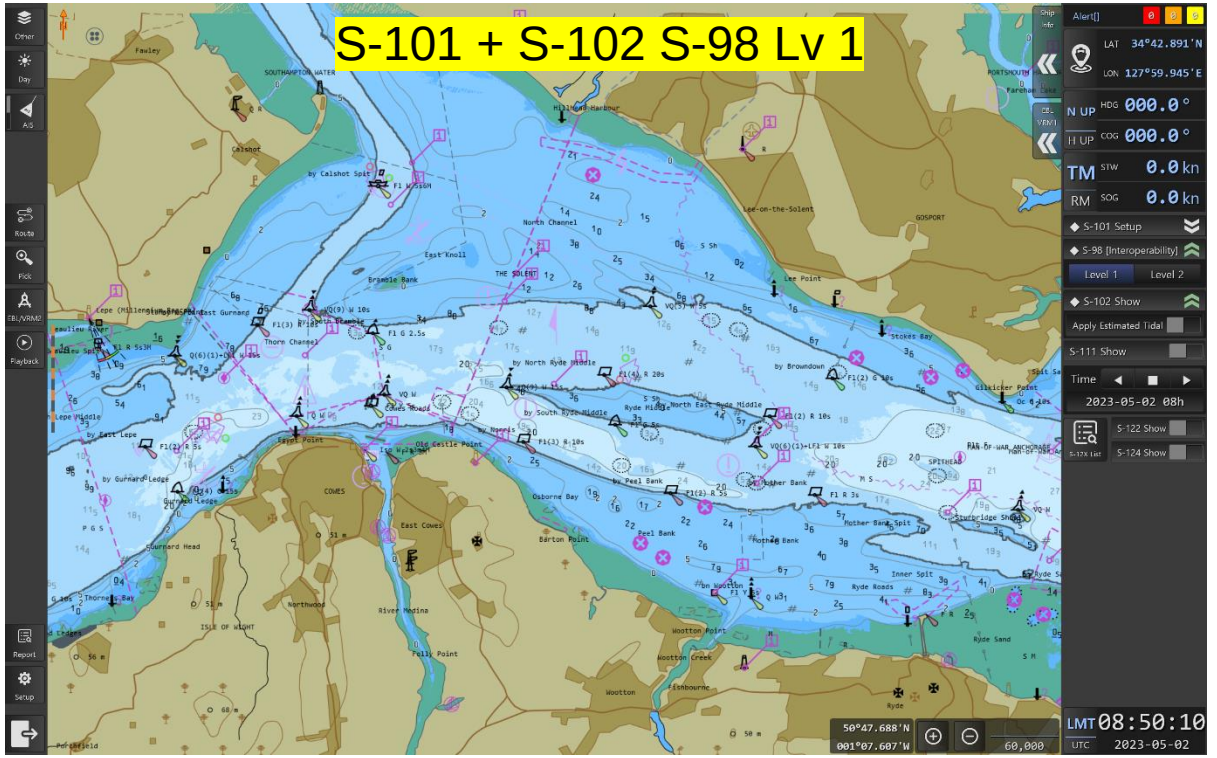
- Provides harmonized portrayal between S-101 ENC and other S-100 based product specifications
- Improves the overall quality and understandability of information to mariners when multiple S-100 based data products are simultaneously displayed on-screen



S-98 Interoperability catalogue

S-98 Level 0 and Level 1 (UKHO S-101, S-102)



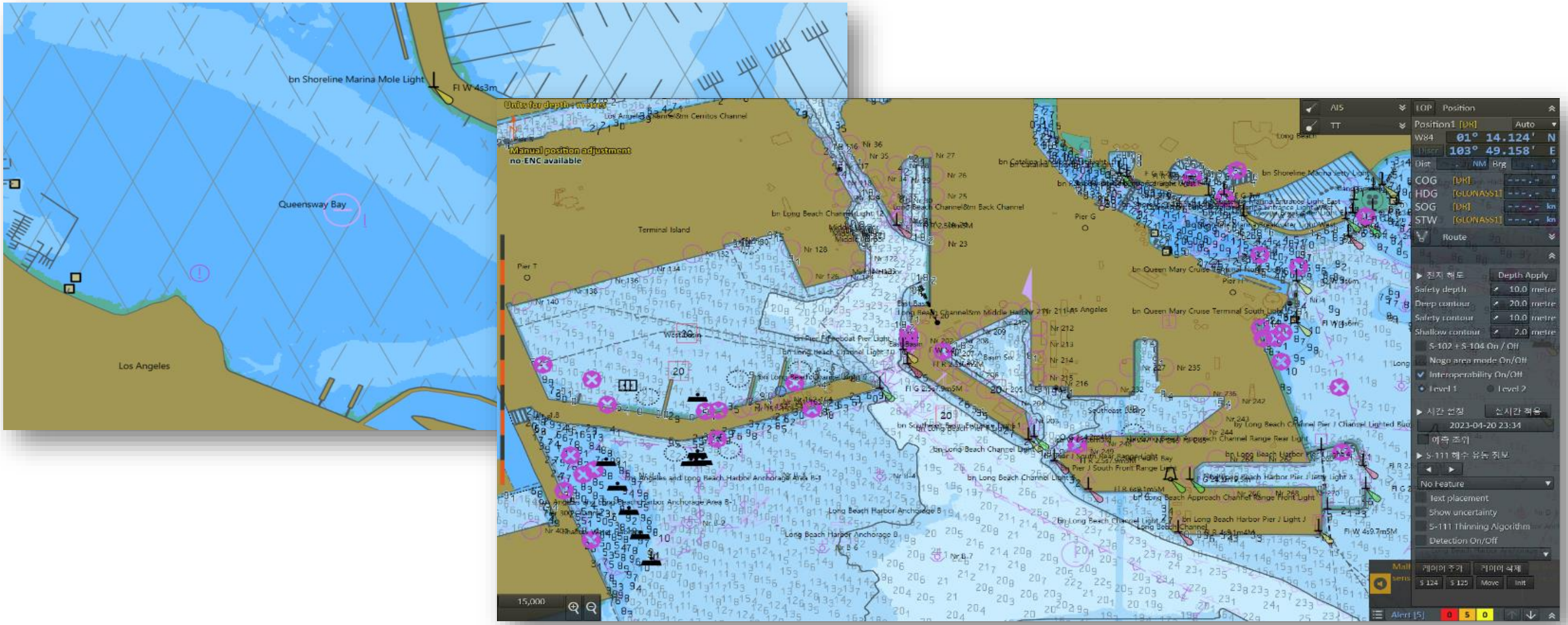


S-98 Interoperability catalogue

S-98 Level 1 (ROK KHOA S-101 + S-102 +S-104)

S-98 Interoperability catalogue

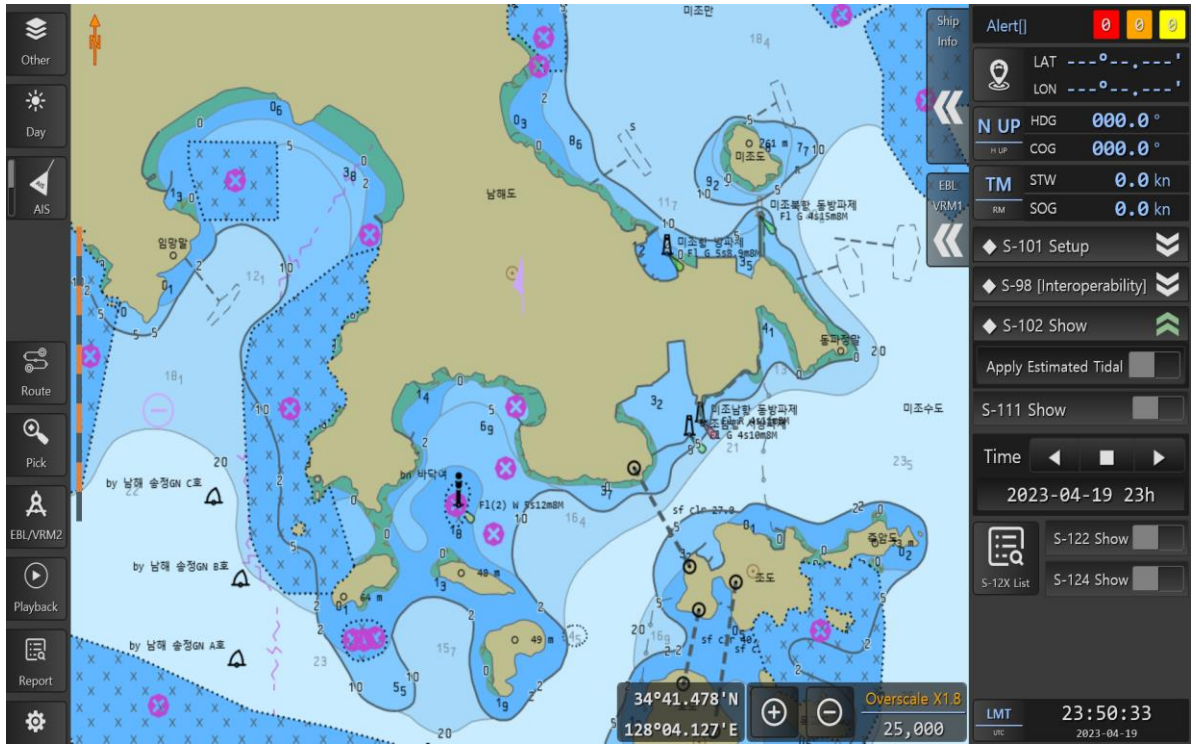
S-98 Level 1 (US NOAA S-101 + S-102)



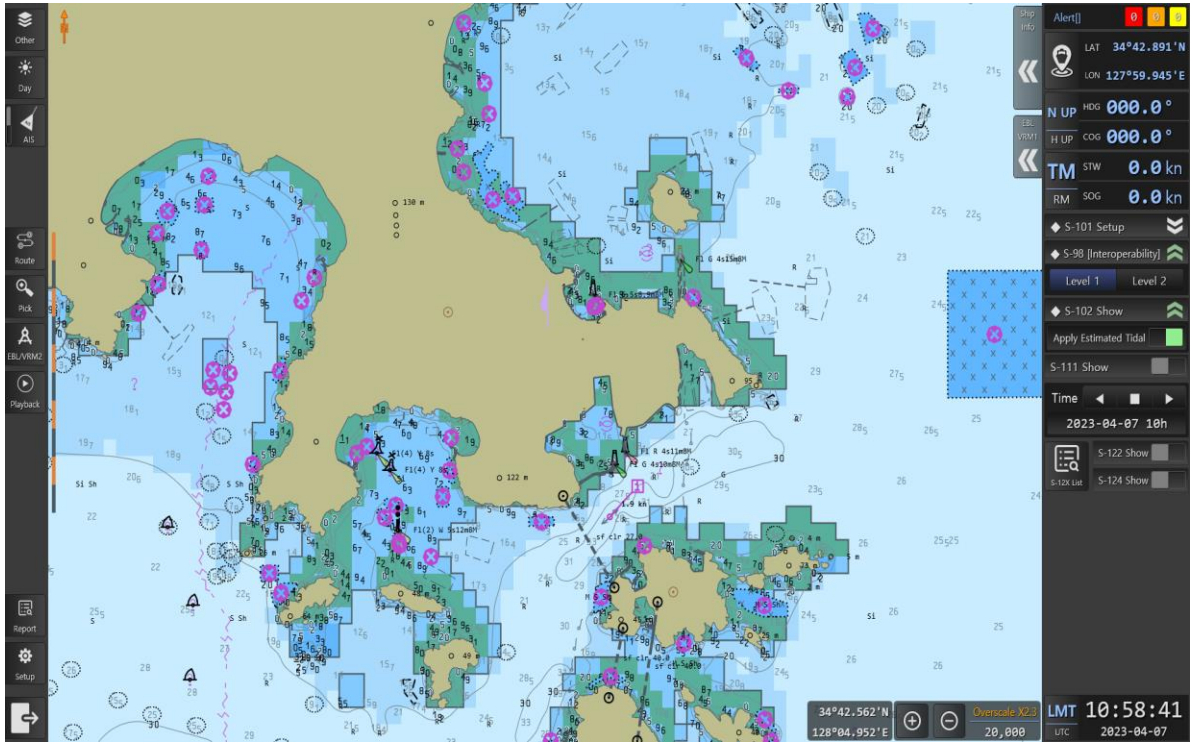
S-98 Interoperability catalogue

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

(S-101 ENC)



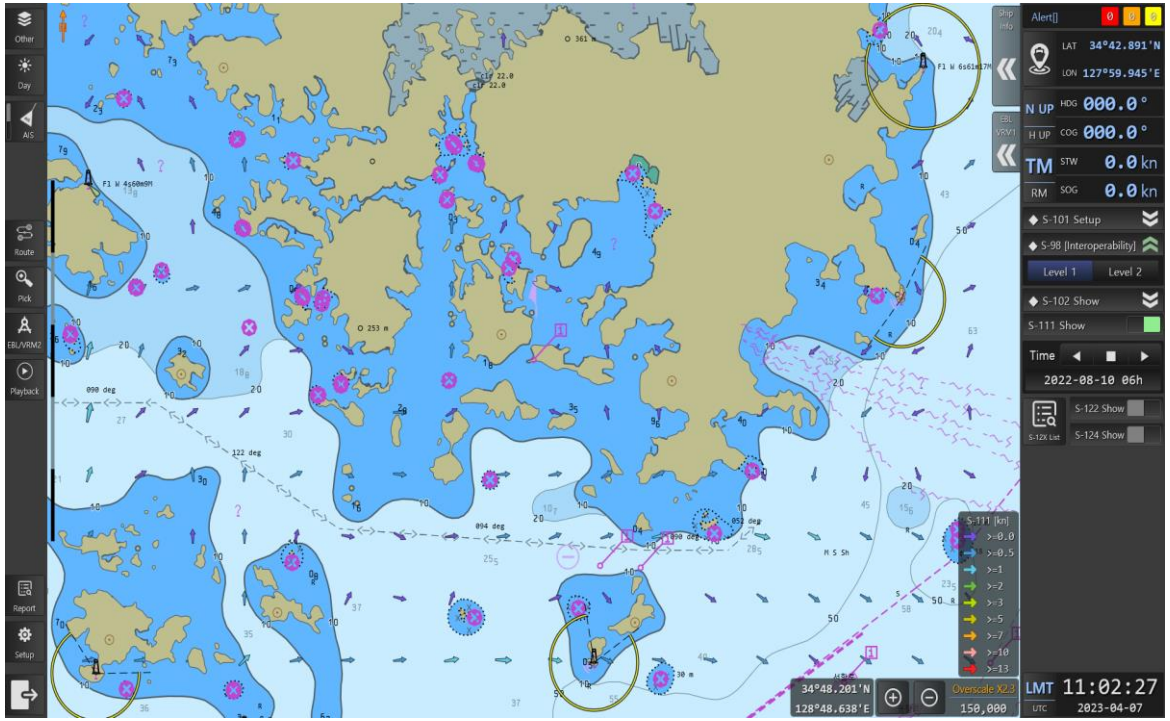
(S-101 ENC + S-102 Bathy surface + S-104 water level, WLA, Safety contour line based on S-102 + S-104))



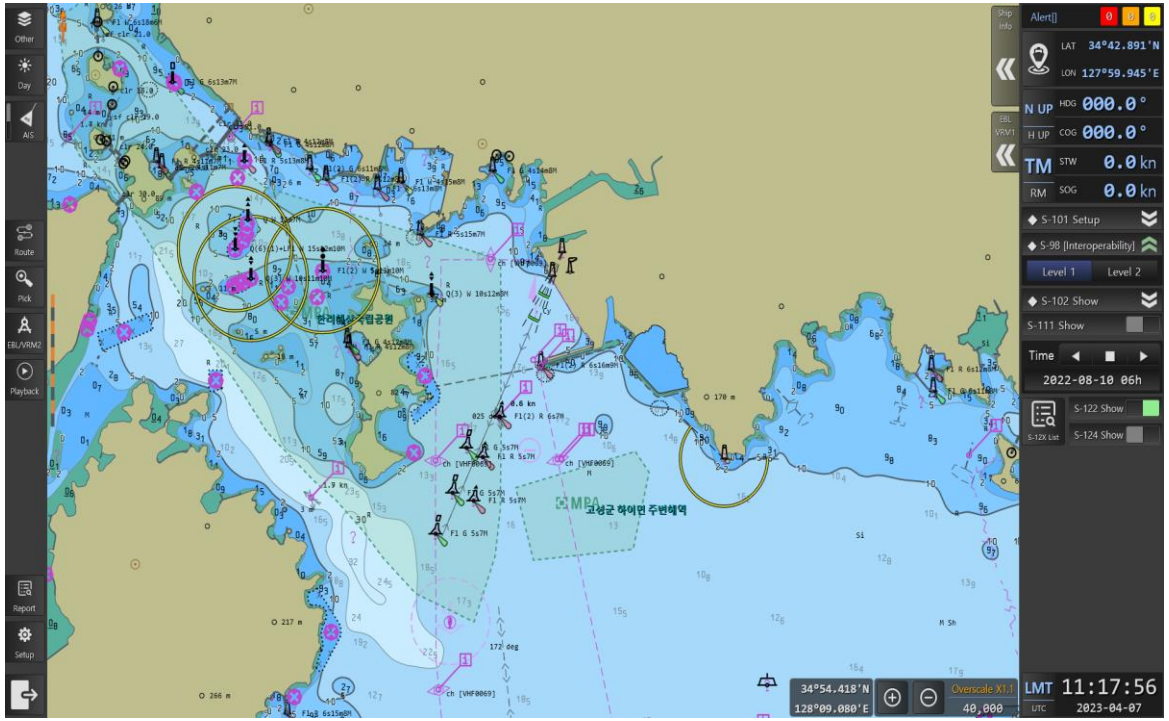
S-98 Interoperability catalogue

S-98 Level 2 (ROK KHOA S-101 + S-111 + S-122)

(S-101 ENC + S-111 Surface currents)



(S-101 ENC + S-122 MPA)



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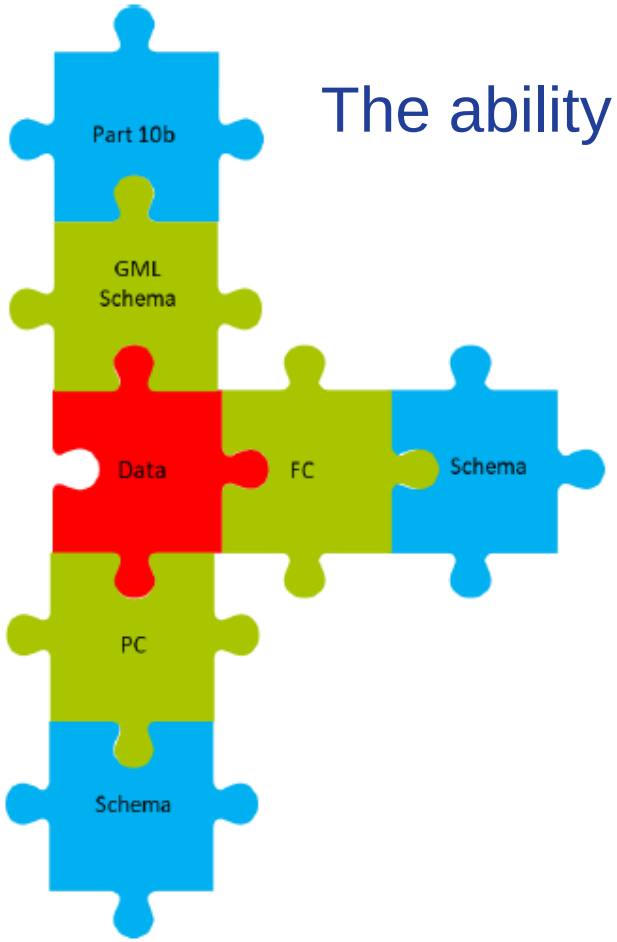
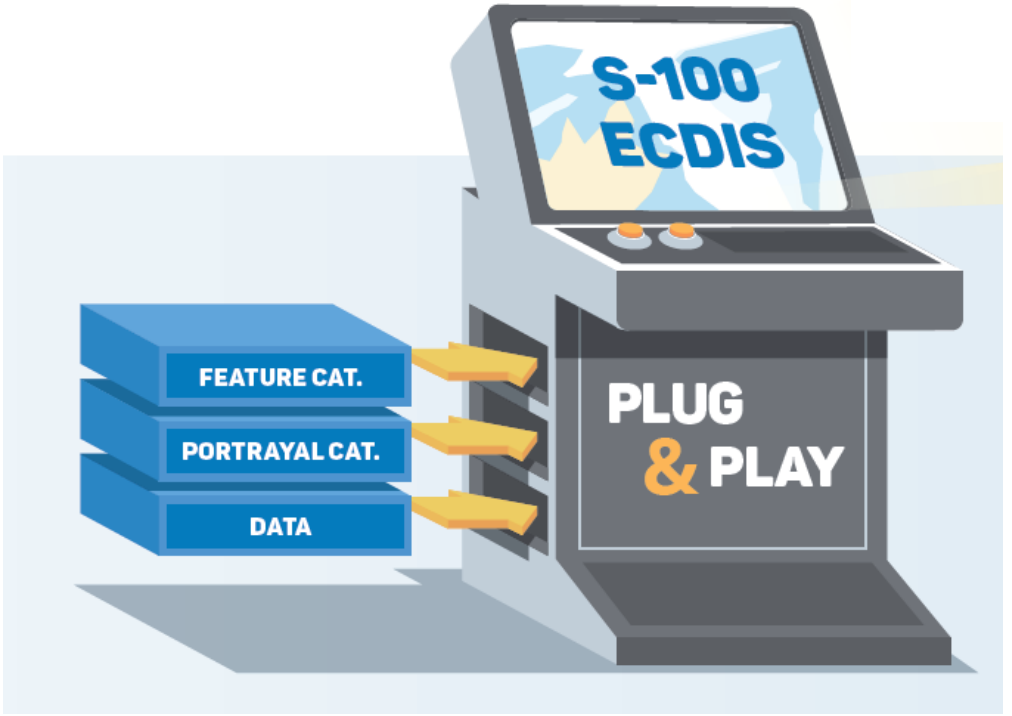
Key features of S-101

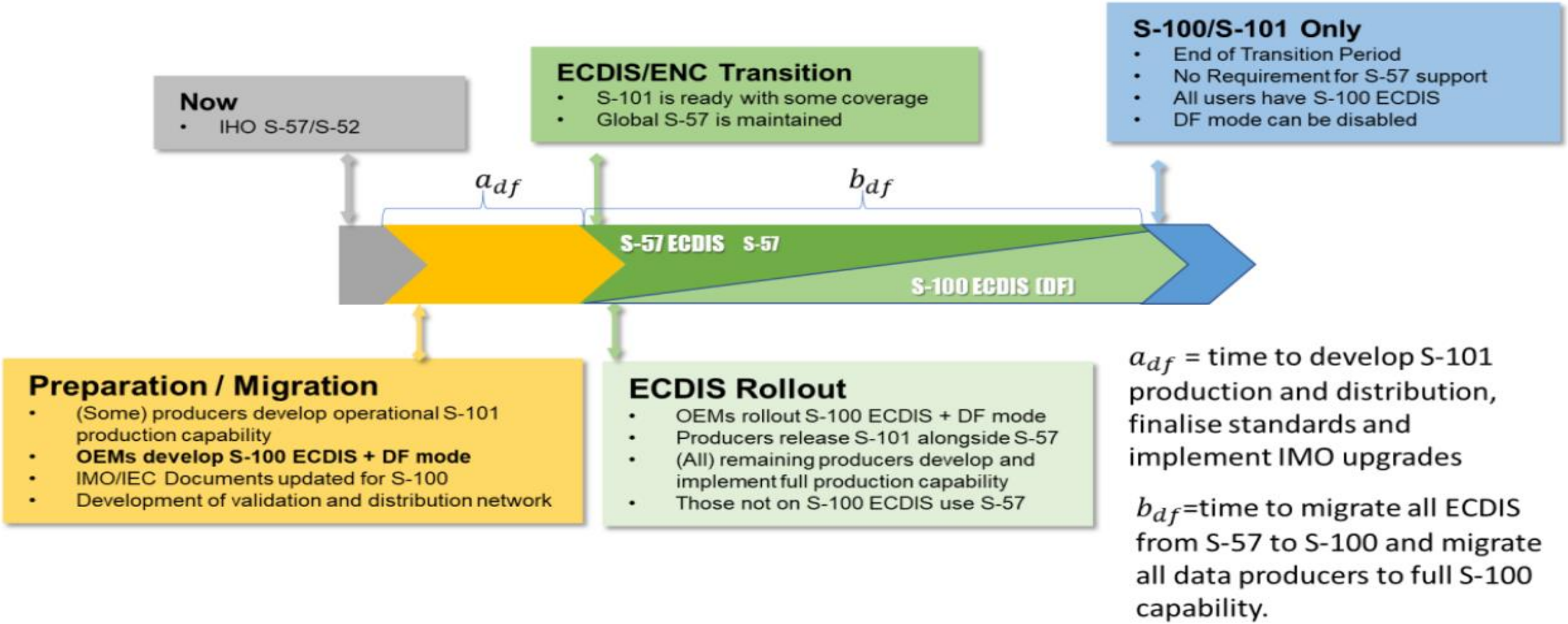
Plug & Play Concept – Feature and Portrayal Catalogues



The ability to add new functionality without requiring system update



Dual Fuel mode

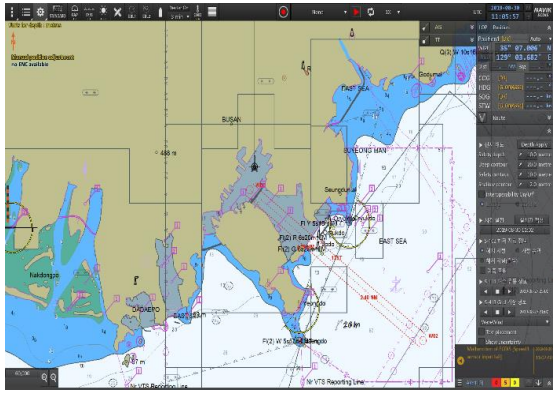


a_{df} = time to develop S-101 production and distribution, finalise standards and implement IMO upgrades

b_{df}=time to migrate all ECDIS from S-57 to S-100 and migrate all data producers to full S-100 capability.

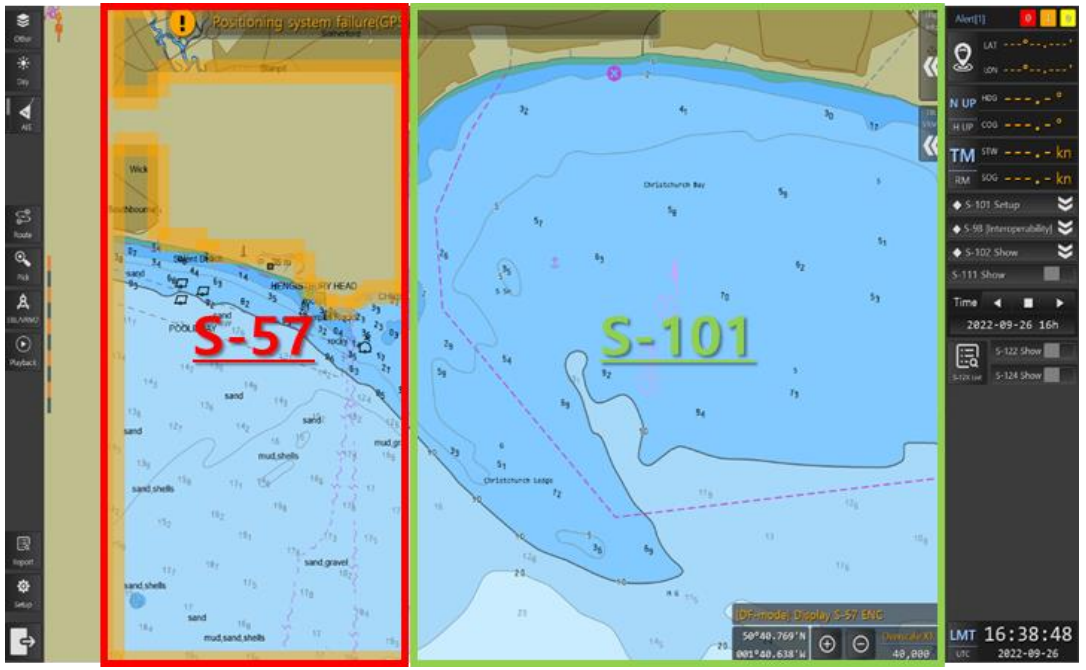
S-100 ECDIS testbed with S-164 (Planned)

ECDIS Testbed
(Shore Based ECDIS)



Full ECDIS based on S-164

Version 2.0 (Now)



Version 2.X with S-164 (Planned)

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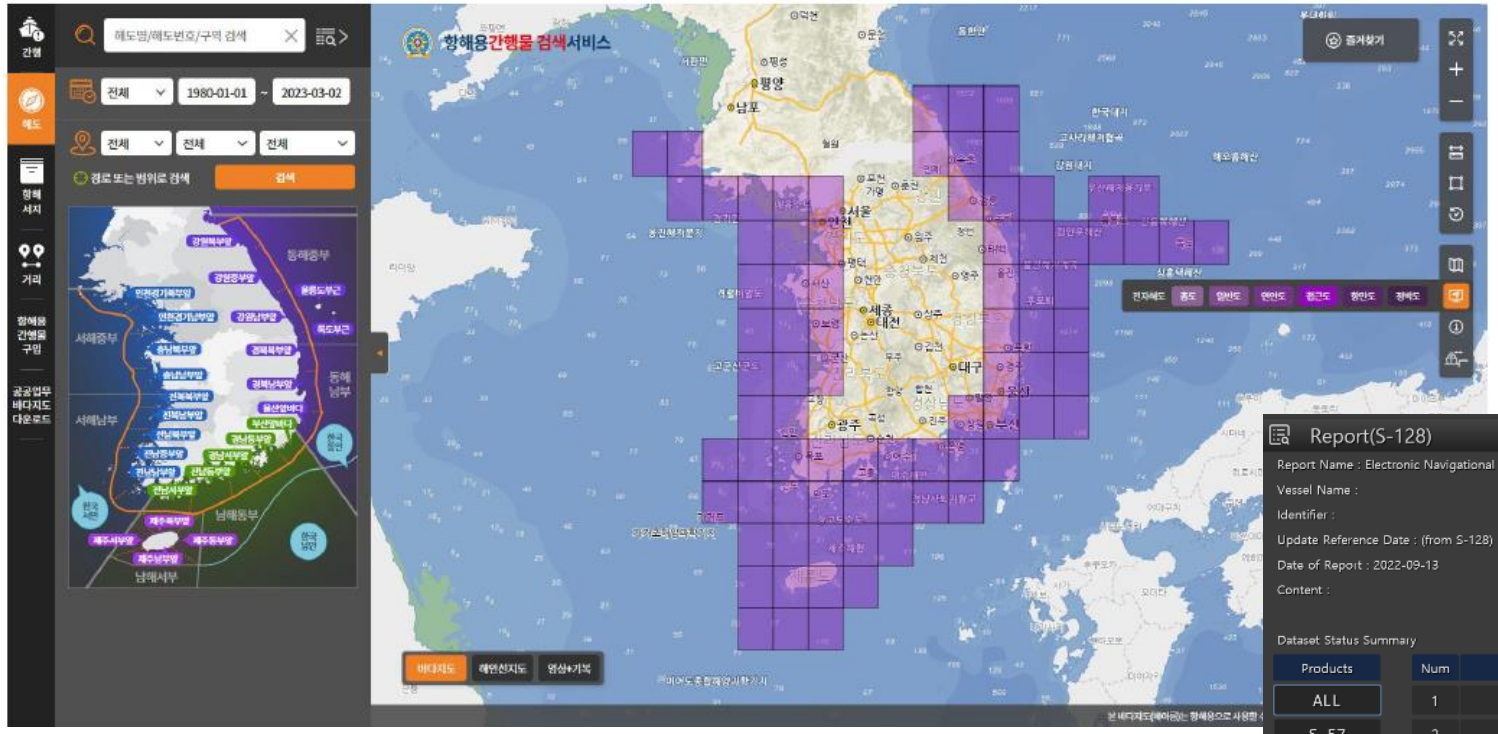
S-128 Catalogue of Nautical Products



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	462
Up to Date	446/462
Not Up to Date	16/462
Withdrawn	0/462
Unknown	0/462

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

Verifying the up-to-dateness using S-128 S-100 product update status report

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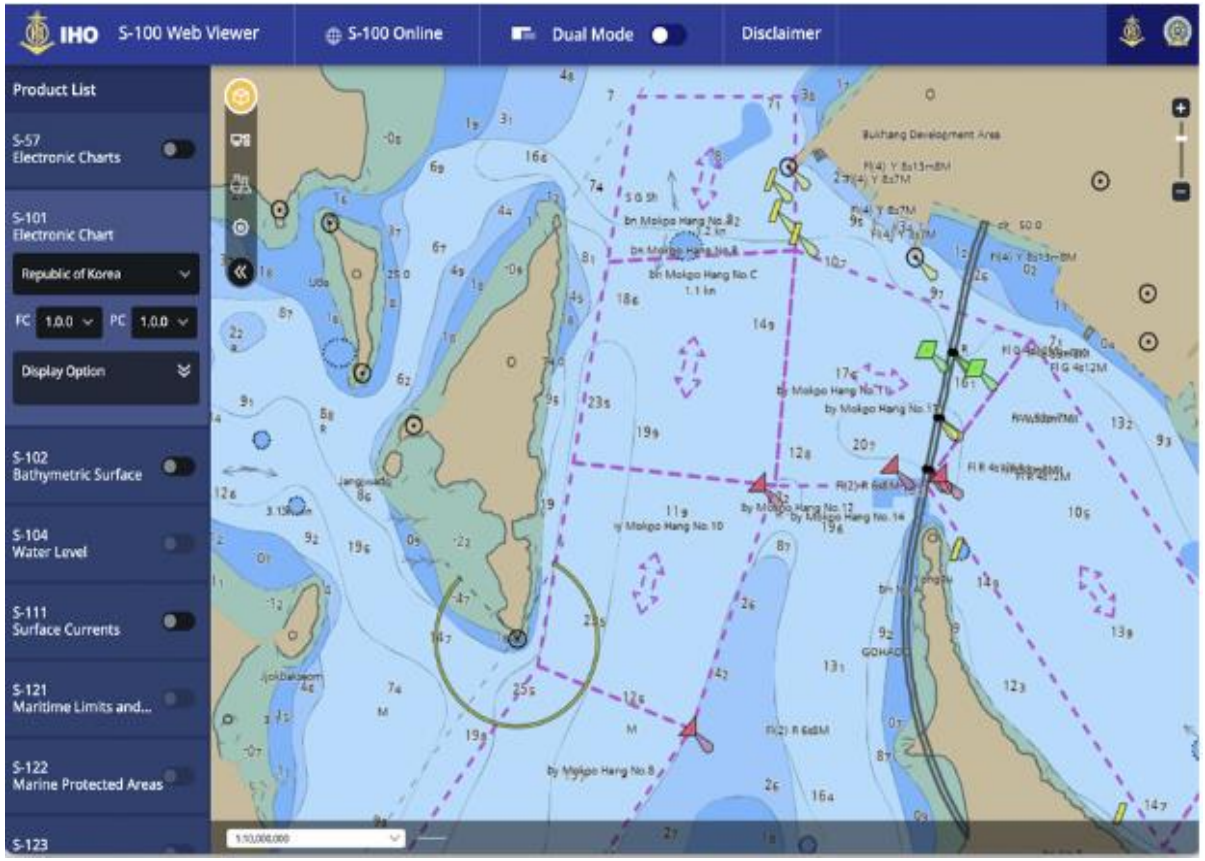
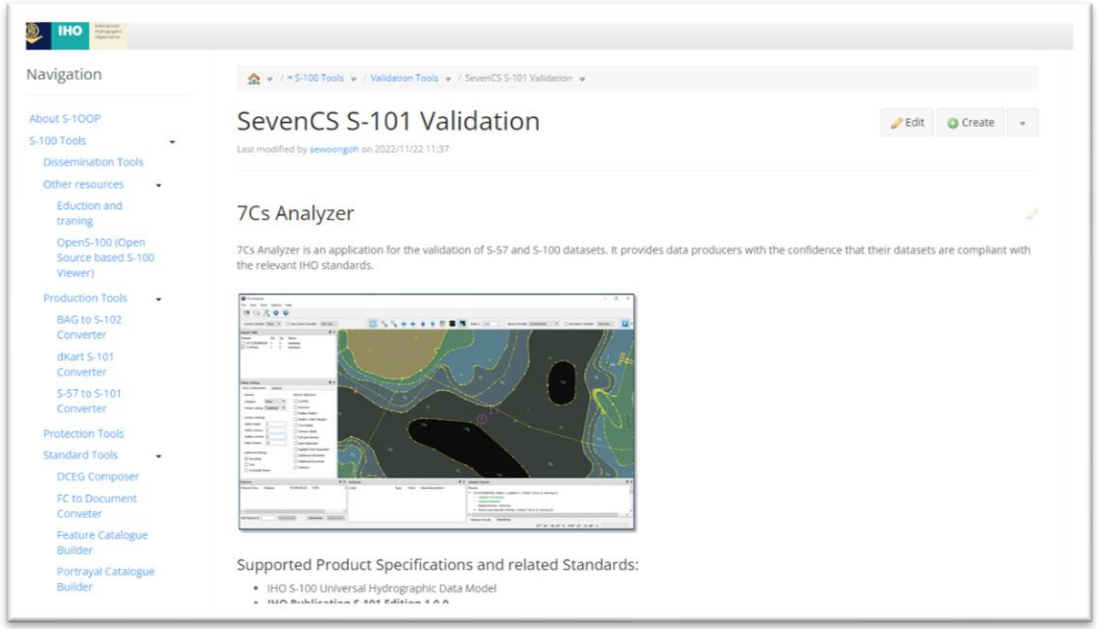
S-1OOP(S-100 Open Online Platform Project)

S-100 community platform to accelerate wider adoption of the S-100 hydrographic framework by joint development.

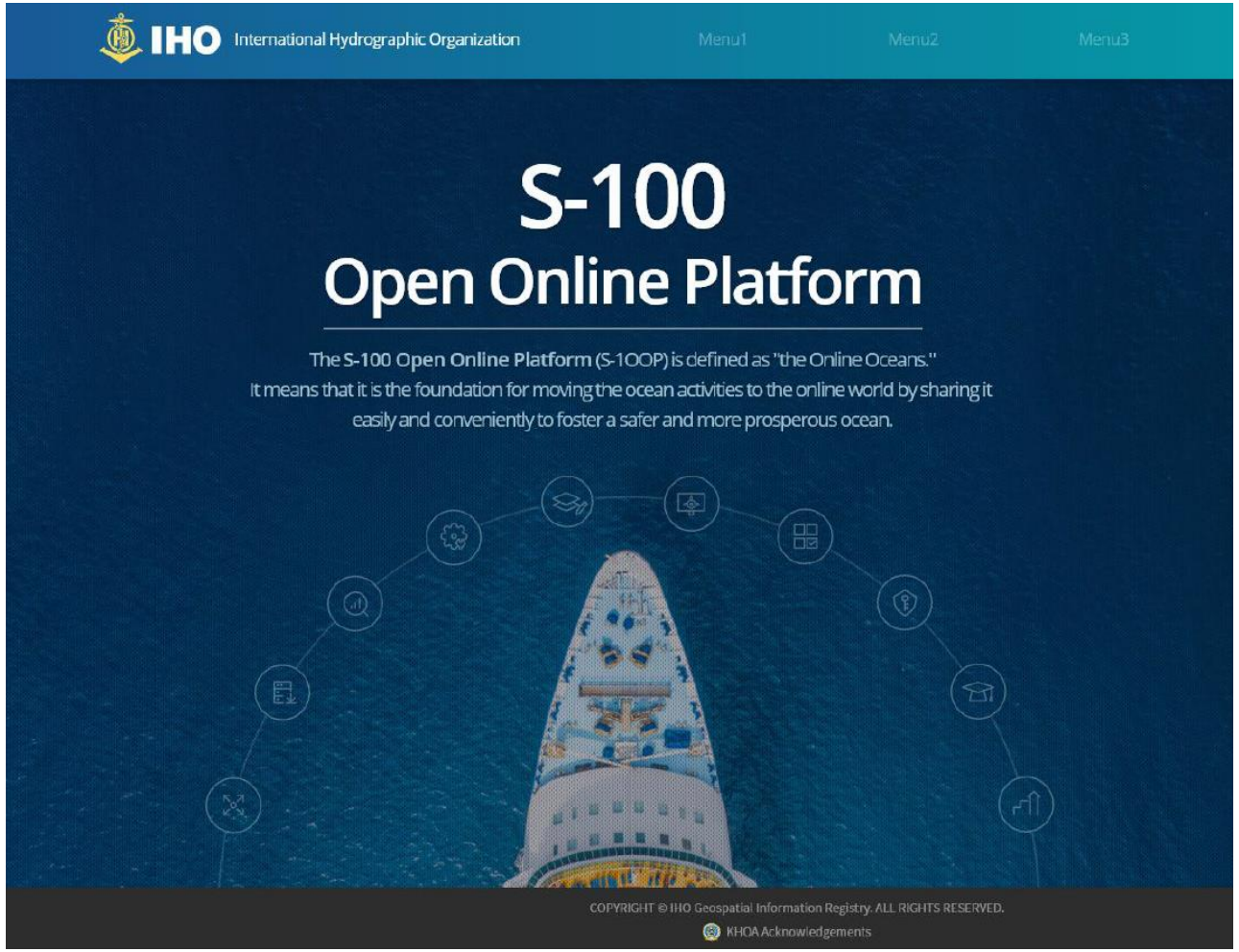


TDS Sharing

S-100 Wiki



S-1OOP(S-100 Open Online Platform Project)



3rd IHO ASSEMBLY
2-5 MAY 2023
MONACO

OEM perspectives

Viewpoints from the ECDIS manufacturers and readiness for S-100

IHO International Hydrographic Organization

CIRM overview

Who we are

- **Comité International Radio-Maritime (CIRM)**, founded 1928
- International non-profit association of marine electronics companies
- NGO in Consultative Status to IMO; Observer at IHO
- More than 100 members, including:
    - Equipment manufacturers
    - Software/application providers
    - Service companies
    - **ECDIS manufacturers and kernel makers**

CIRM overview

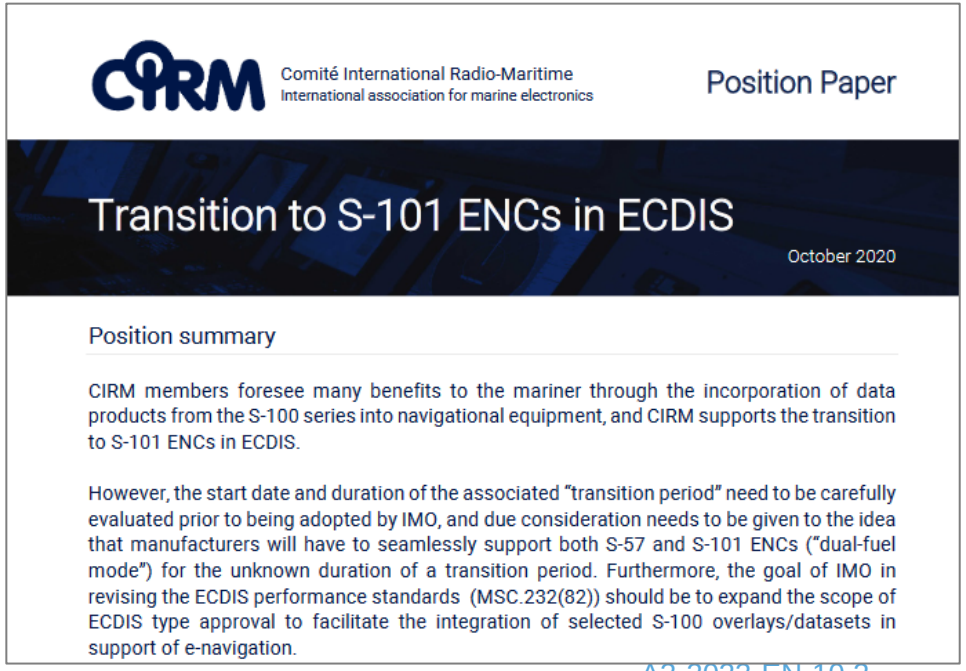
What we do

- Represent the marine electronics industry, internationally
- Contribute to development of regulations and standards
- Enable companies to exchange ideas and opportunities
- Provide specialist information service to members

CIRM overview

Work on S-100

- CIRM supports the work of IHO to develop S-100 ECDIS, through our ECDIS Working Group
- We have contributed to IHO workshops on S-100 and development of Dual-Fuel mode of operation
- We contributed to development of MSC.530(106) – IMO's performance standards for S-100 ECDIS
- CIRM internally promotes work of IHO's technical working groups and encourages member participation in this work



CIRM Comité International Radio-Maritime
International association for marine electronics

Position Paper

Transition to S-101 ENCs in ECDIS

October 2020

Position summary

CIRM members foresee many benefits to the mariner through the incorporation of data products from the S-100 series into navigational equipment, and CIRM supports the transition to S-101 ENCs in ECDIS.

However, the start date and duration of the associated "transition period" need to be carefully evaluated prior to being adopted by IMO, and due consideration needs to be given to the idea that manufacturers will have to seamlessly support both S-57 and S-101 ENCs ("dual-fuel mode") for the unknown duration of a transition period. Furthermore, the goal of IMO in revising the ECDIS performance standards (MSC.232(82)) should be to expand the scope of ECDIS type approval to facilitate the integration of selected S-100 overlays/datasets in support of e-navigation.

OEM perspectives

Importance of S-100

- CIRM members are fully behind move to next-generation ECDIS (S-100 ECDIS)
- Main driver behind moving to S-100 ECDIS is not ability to use S-101 ENCs… but possibilities associated with integration of datasets/overlays provided through other S-100 product specifications under development (e.g. “S-102 - Bathymetric Surface”)
- CIRM members foresee **many benefits to the mariner** through the incorporation of data products from the S-100 series into ECDIS, e.g. dynamic adjustment of safety contour
- IMO’s new ECDIS performance standards (MSC.530(106)) facilitate integration of S-100 datasets/overlays, paving way to realising full potential of S-100 ECDIS

OEM perspectives

Readiness for S-100

- CIRM's ECDIS manufacturers are keen to implement S-100 ECDIS, and committed to doing so
- Manufacturers feel they are as **ready as they can be** to bring S-100 ECDIS to market
- Main concerns:
    - Manufacturers are unable to be ahead of the standards; the critical S-100 ECDIS-related standards need to be ready (IHO, IEC)
    - Robust test data is required so systems can be developed, tested and approved
    - Actual availability of data across the key S-100 product specifications will be essential
    - A firm end date for provision of S-57-based ENCs is highly desirable, to minimise ongoing maintenance of legacy systems

OEM perspectives

When will S-100 ECDIS be available?

- IMO's new ECDIS performance standards (MSC.530(106)):
    - Recommend that Governments allow **optional** installation of S-100 ECDIS from 1 Jan 2026
    - Recommend that Governments require **mandatory** installation of S-100 ECDIS from 1 Jan 2029
- ***Will we see S-100 ECDIS on the market during the "optional period" (1 Jan 2026 - 1 Jan 2029)?***
    - Manufacturers are committed to achieving this, if possible
    - **But** - manufacturers are unable to be ahead of the S-100 standards
    - We also need sufficient data to be available, to realise the benefits of S-100 ECDIS and convince the users to move over… this applies to more than S-101 availability!

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Questions?

IHO
International Hydrographic Organization