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Development of Standards-Based Maritime Services on a Digital Route Testbed

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Korea Research Institute of Ships & Ocean Engineering
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KRISO KOREA RESEARCH INSTITUTE OF SHIPS & OCEAN ENGINEERING



Technology Development of Maritime Digital Route Testbed

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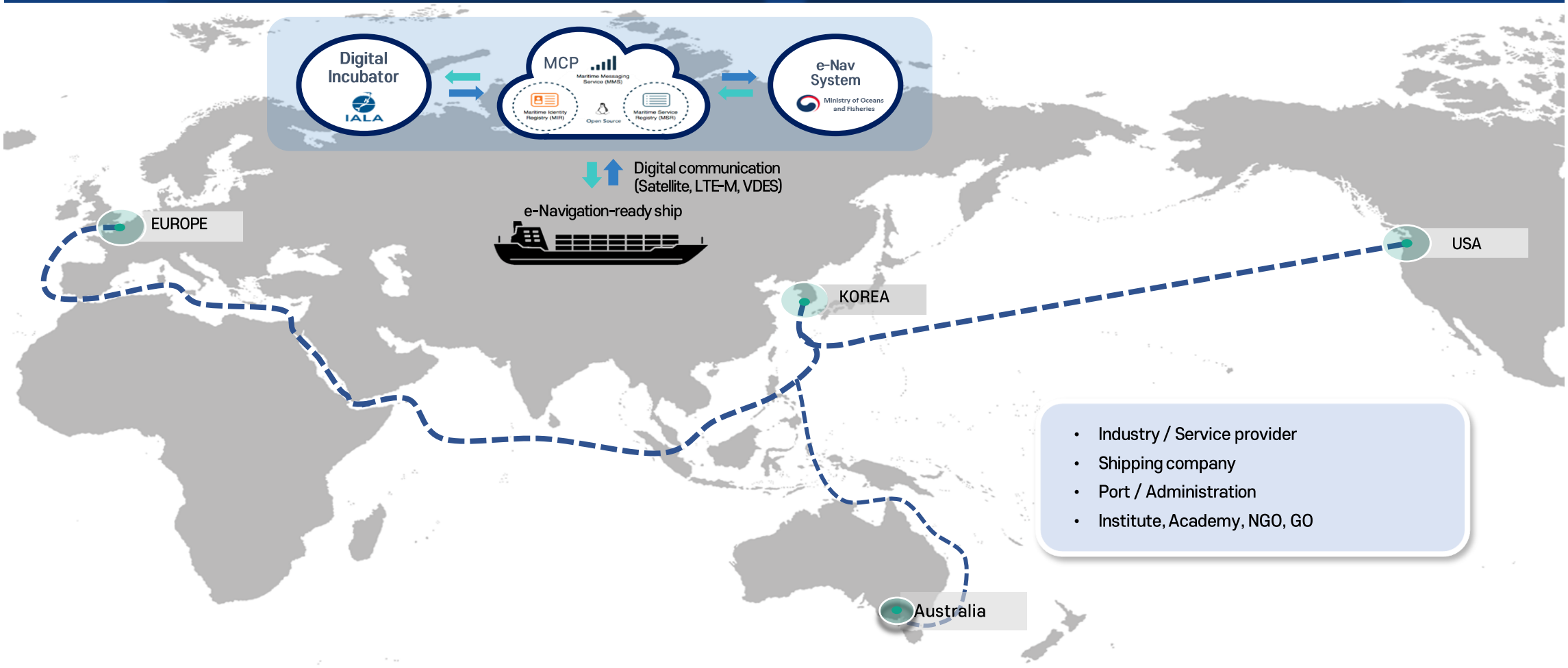
1

Overview

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1.1 Background

Development of an integrated system that can use maritime digital route technology and services for international scale demonstration of digital maritime services developed by each country or region



1.2 GMDRT Project

Vision

Development of integrated system for international maritime digital services

Group 1 Development of INOS

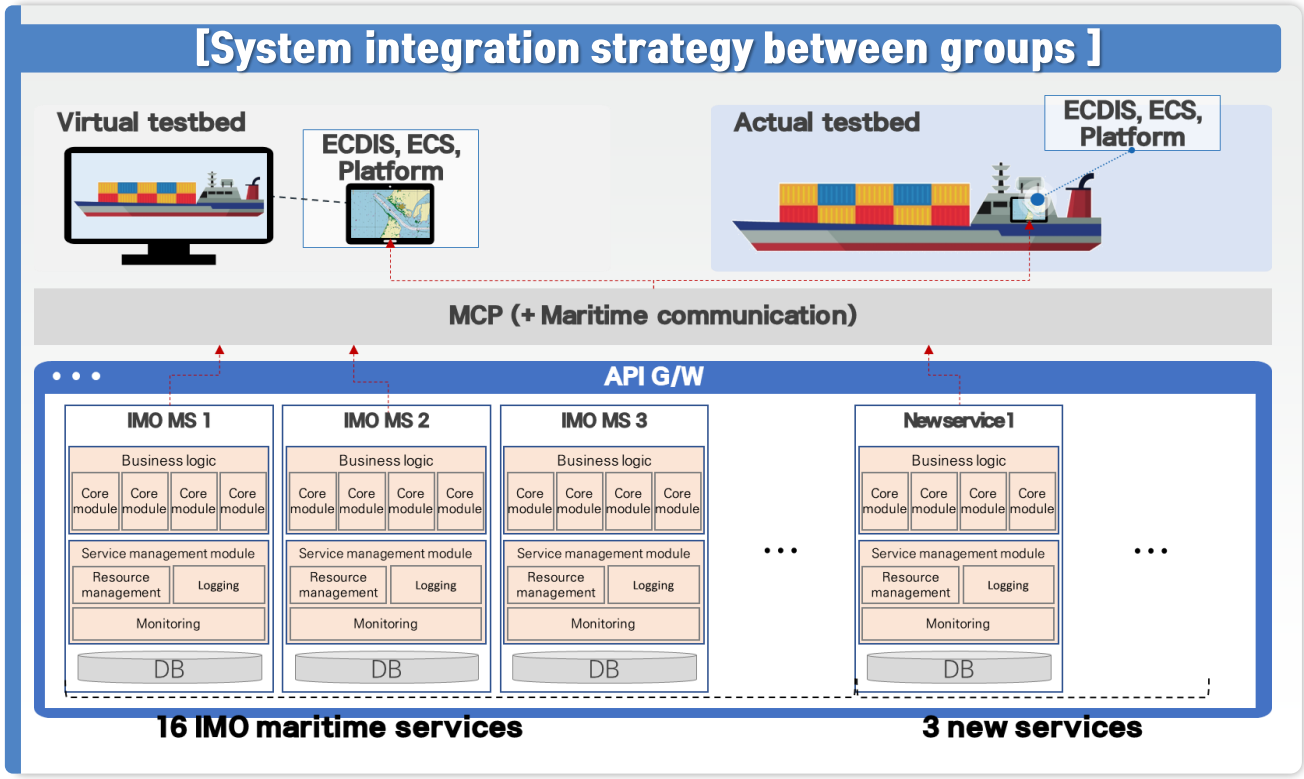
- International standard-based INOS (Intelligent Onboard System) prototype and standard

Group 2 Development of open CP

- Global maritime connectivity platform standard and technology

Group 3 Global testbed establishment

- Digital maritime services based on global testbed
- IMO maritime services and new services

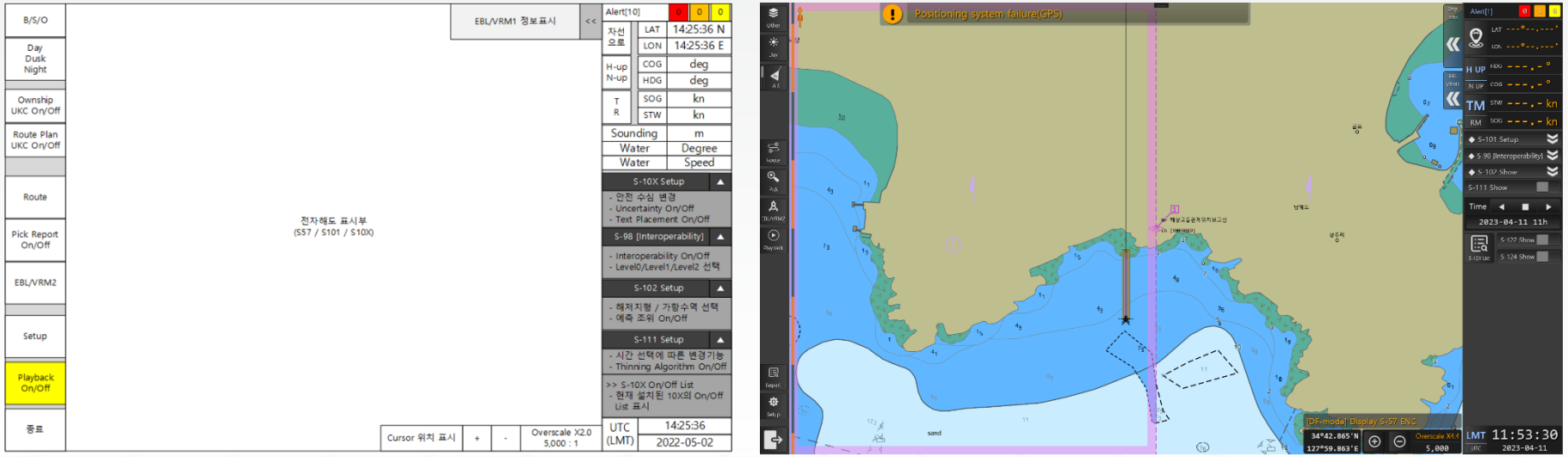


1.3 Dual-Fuel ECDIS (Group 1)

Details

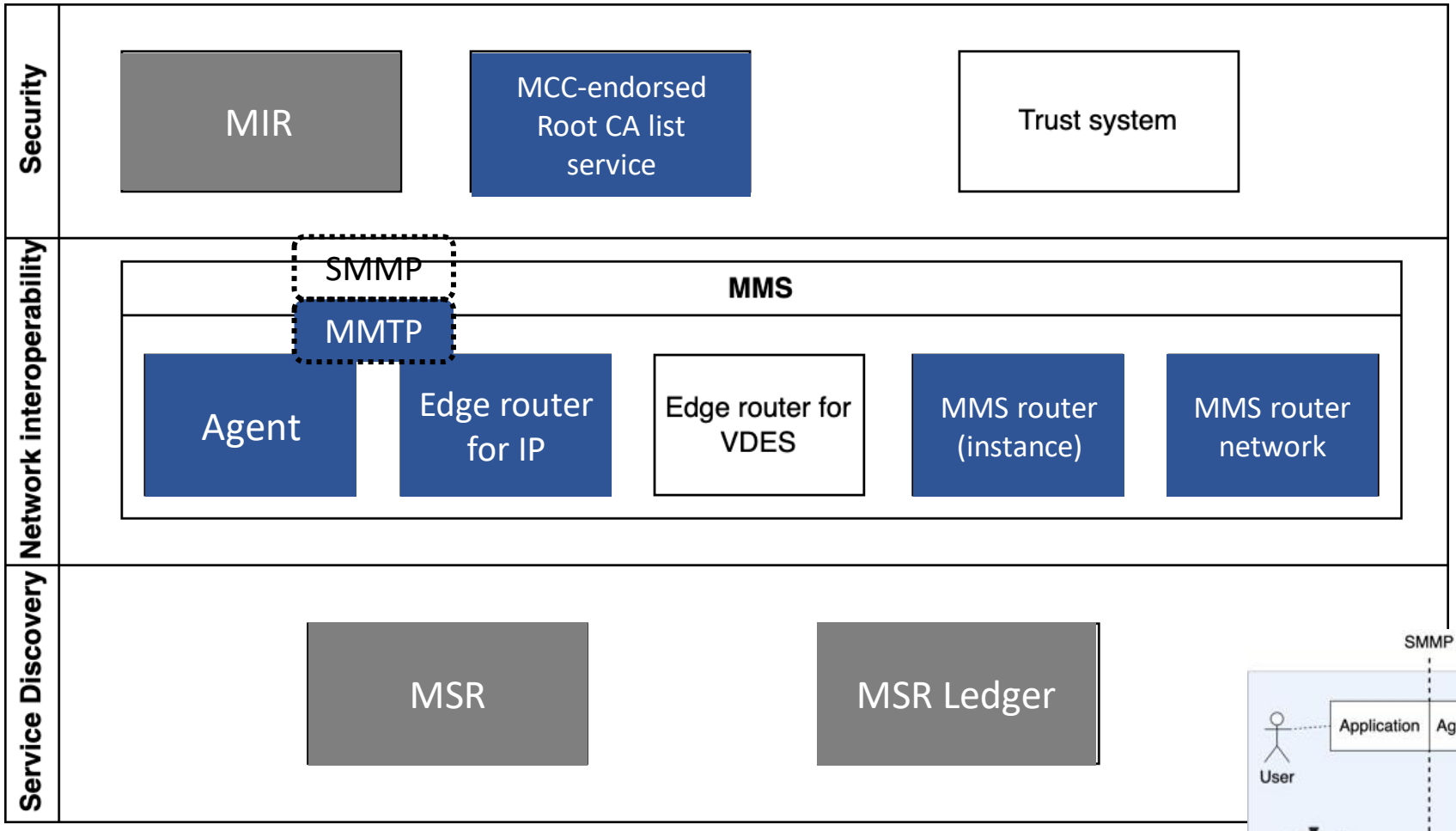
Development of Dual-Fuel ECDIS

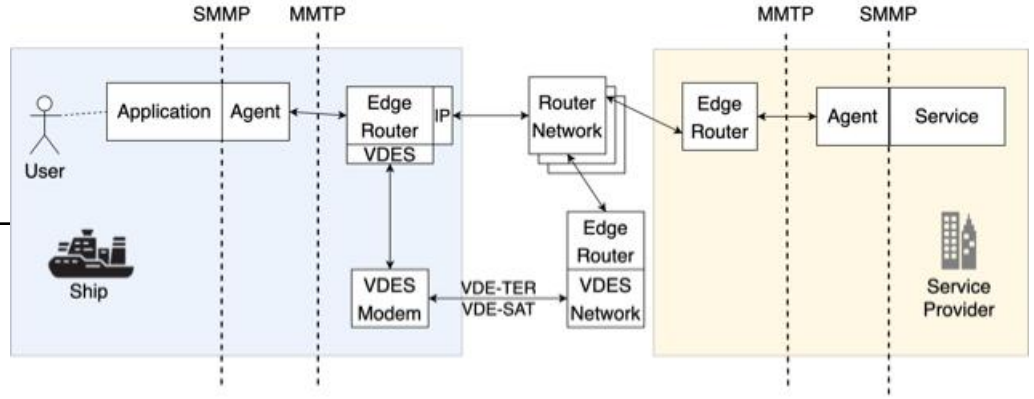
- Group 1 covers small-vessel systems, ECDIS, and navigation platforms for future applications.
- Specifications and conformity-assessment guidelines are developed alongside the equipment.



S-57 / S-101 chart display

1.4 Open Connectivity Platform (Group 2)





1.5 Digital Maritime Services in the Global Testbed (Group 3)

GMDRT Services (1/2)

ID	Name	Data	Service Description
MS1	Vessel traffic service (VTS)	AIS ASM (VTS-generated/synthetic targets)	Nearby vessel information
		S-212 (VTS Digital Information) S-421 (Route Plan)	Traffic Clearance Service (New)
MS4	Port support service (PSS)	S-211 (Port Call Message Format)	Port Call Message (New)
MS5	Maritime safety information (MSI) service	S-124 (Navigational Warnings) S-412 (Weather and Wave Hazards)	Navigation warnings and weather warnings
MS8	Vessel shore reporting	EPC (Electronic Port Clearance, ISO 28005-2)	Partial implementation of EPC (New)
MS12	Nautical publications service	S-122 (Marine Protected Areas) S-123 (Marine Radio Services) S-127 (Marine Traffic Management)	Nautical publication
MS13	Ice navigation service	S-411 (Ice Information)	EU service
MS14	Meteorological information service	S-412 (Weather and Wave Hazards) S-413 (Weather and Wave Conditions) S-414 (Weather and Wave Observations)	Marine weather information
MS15	Real-time hydro and environmental information service	S-102 (Bathymetric Surface) S-104 (Water Level Information for Surface Navigation) S-111 (Surface Currents)	Real-time hydro and environmental information service
Add.1	Low carbon emission route planning service	S-421 (Route Plan)	Minimum carbon emission route (New)

1.5 Digital Maritime Services in the Global Testbed (Group 3)

GMDRT Services (2/2)

ID	Name	Data	Service Description
MS1	Vessel traffic service (VTS)	S-124 (Navigational Warning) S-421 (Route Plan)	Hazard information around the route
		S-212 or S-127 (Marine Traffic Management)	Slow speed regulation information (New)
MS4	Port support service (PSS)	S-127 or S-131 (Marine Harbor Infrastructure)	ISPS Validity Notification (New)
MS6	Pilotage service	S-127 (Marine Traffic Management)	Port pilotage information
MS7	Tug service	ASM (VTS-generated/synthetic targets)	Tug location information
MS9	Telemedical assistance service (TMAS)	S-212 (VTS Digital Information)	Hospital and clinic information (New)
MS10	Maritime assistance service (MAS)	S-212 (VTS Digital Information) S-123 (Marine Radio Services) - Contact for MAS	SOS function
MS11	Nautical chart service	S-101 (Electronic Navigational Chart)	ENC update
MS16	Search and rescue (SAR) service		(New)
Add.2	Ship performance management service		Speed and engine settings considering CII rating (New)
Add.3	Estimated time of departure prediction service	S-211 (Port Call Message Format)	AI-based ETD prediction (New)

2

Standards-Based Maritime Services

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2.1 Digital Service Standards

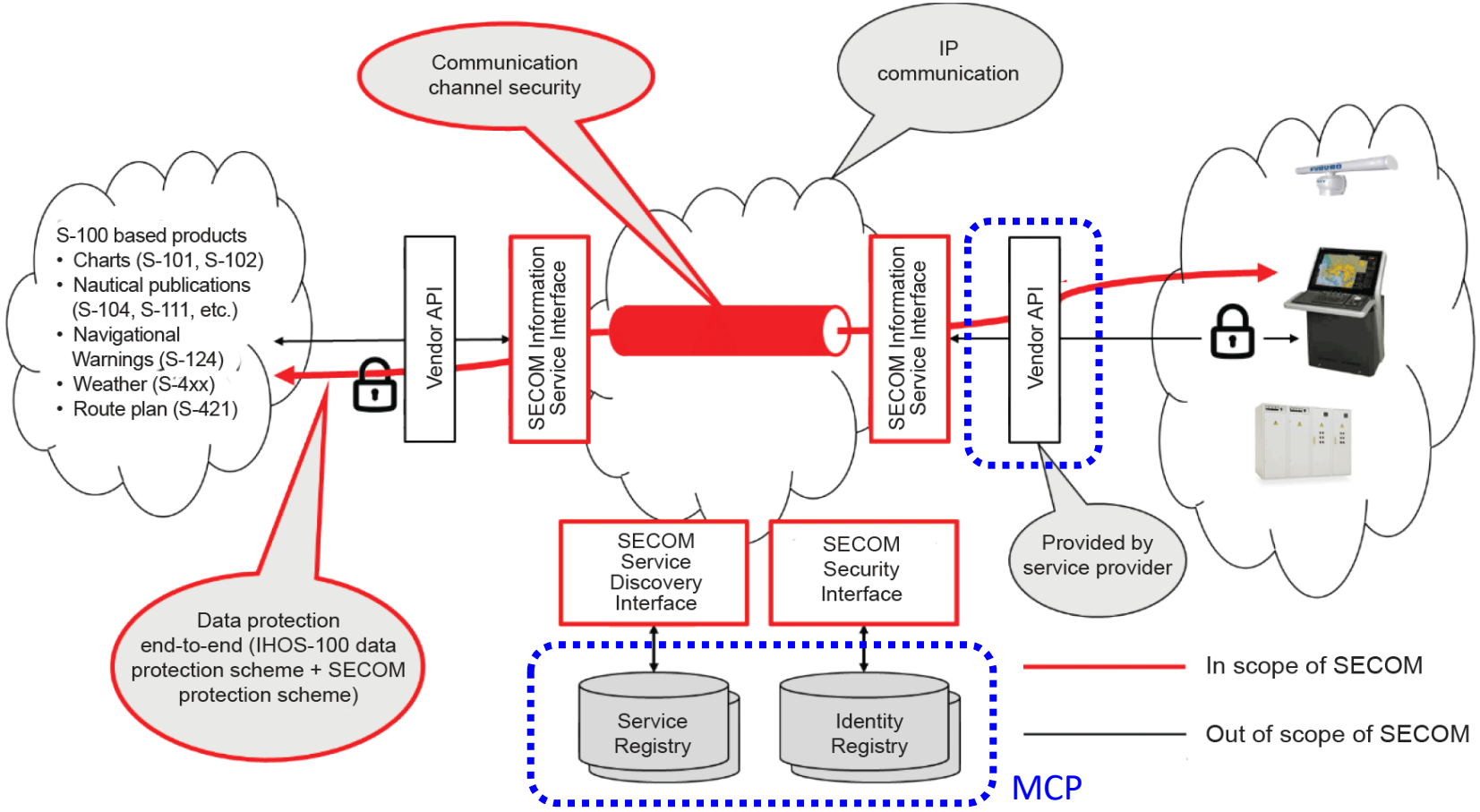
Resolution MSC.530(106)/Rev.1 (2024)
Performance Standards for Electronic Chart Display and Information Systems (ECDIS)

11.3.4 It should be possible to exchange, send and receive both selected and alternative route plans with shore-based Maritime Service providers. The exchange should be in accordance with standard formats for route plan exchange (IEC 61174/IEC 63173-1) and should use standard service interfaces including information security protection (IEC 63173-2) to allow for secure machine-machine communication…

2.1 Digital Service Standards

IEC 63173-2 (2022)

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



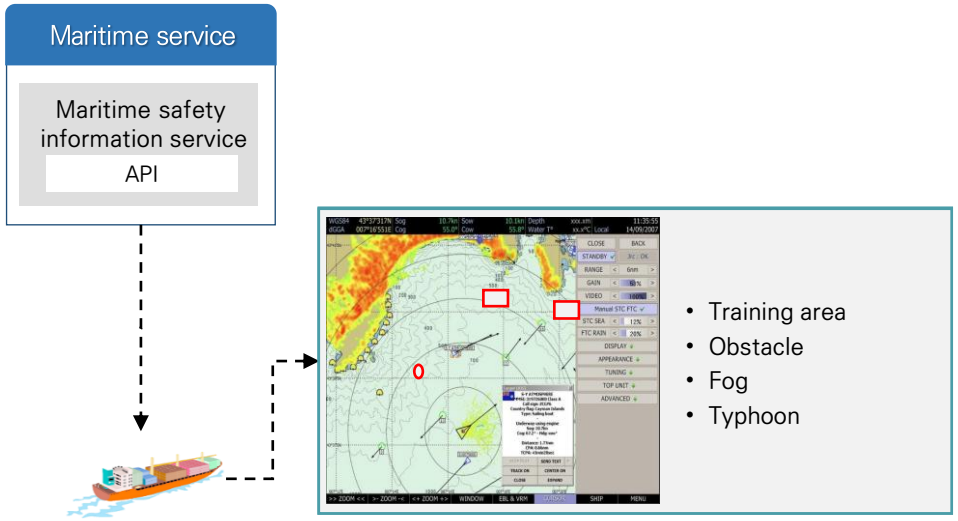
IEC

2.2 Maritime Service Details

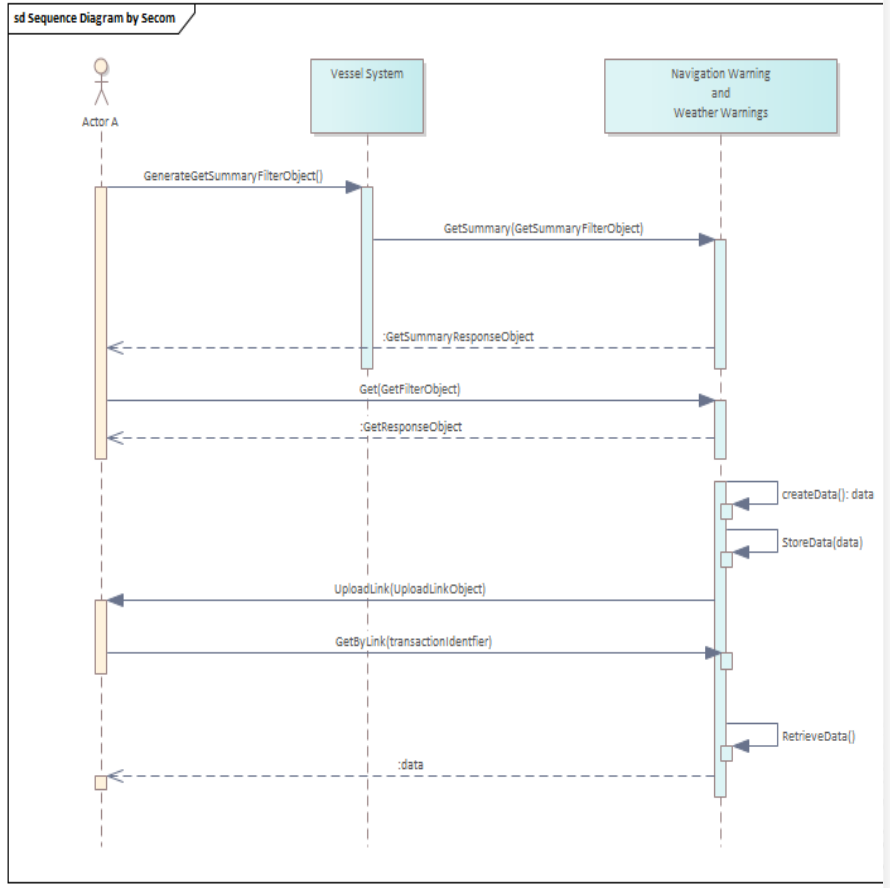
Details

1 Navigational warning service

- Navigational warning service provides hazard areas, including training areas and severe weather areas.
- Navigational warning data are provided with S-124.



Maritime safety information service (example)

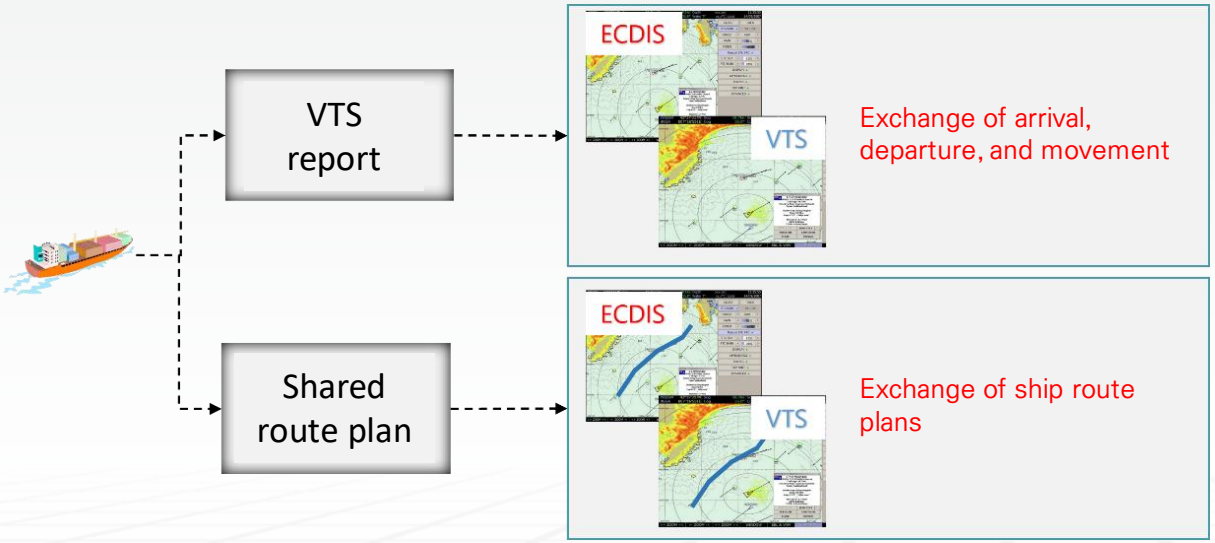


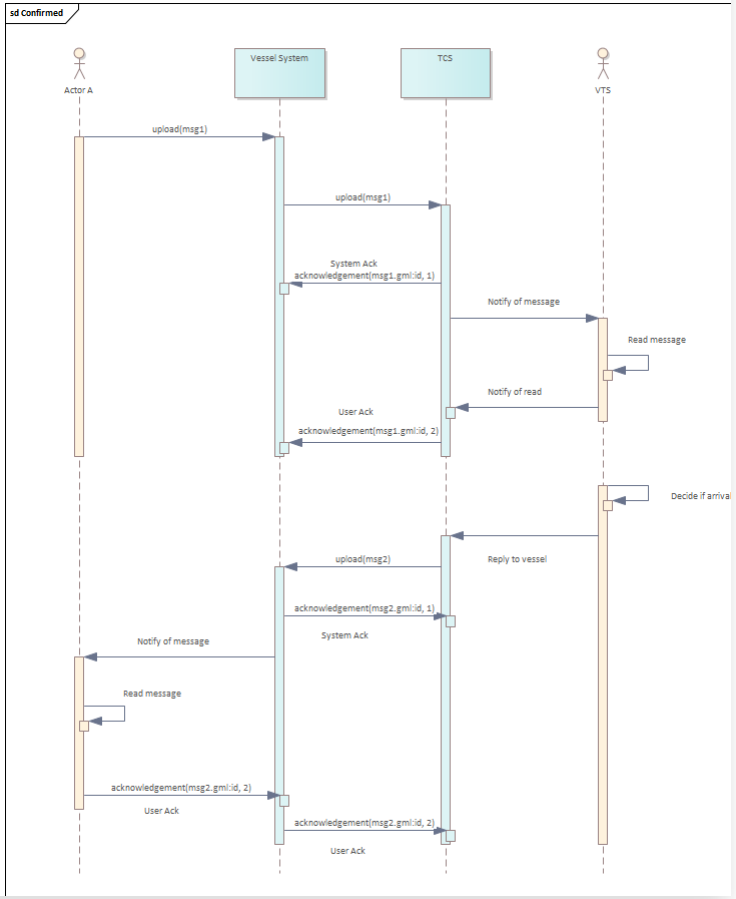
2.2 Maritime Service Details

Details

2 Traffic clearance service

- Service provide the ship departure/arrival event and cargo loading/unloading.
- Through the service, route plans are mutually shared through S-212.



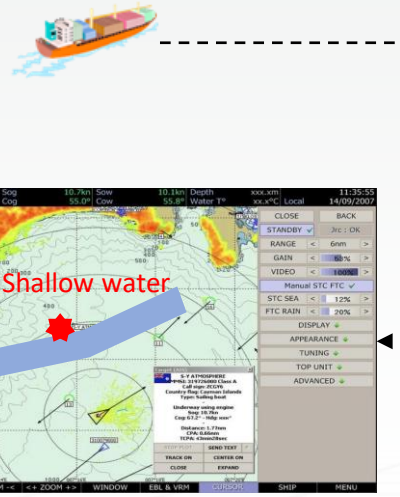


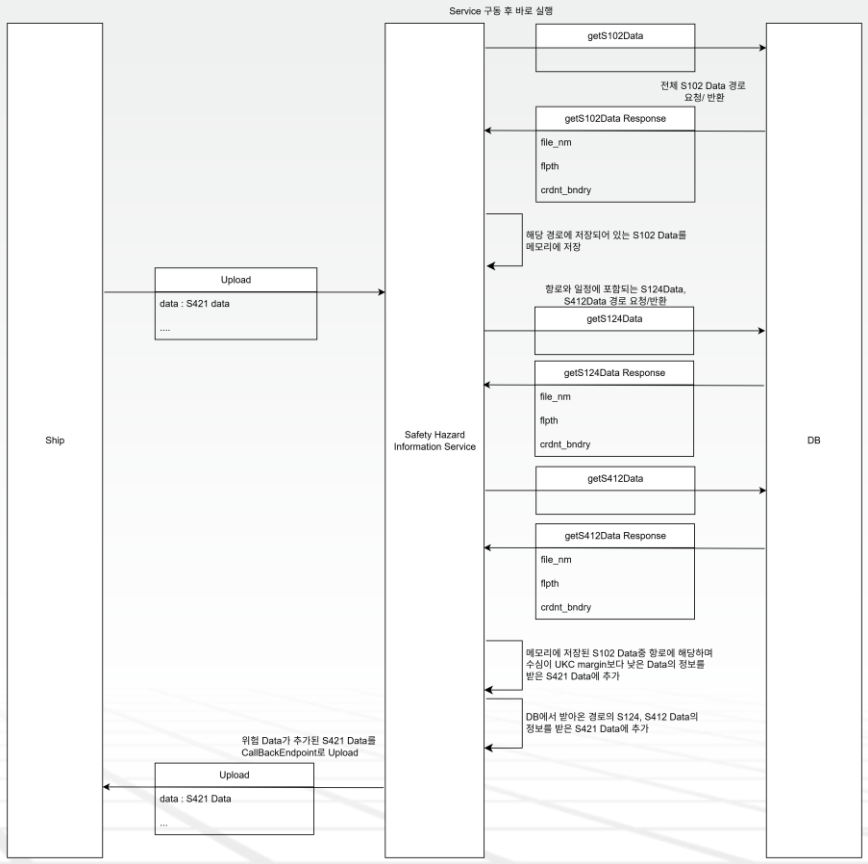
2.2 Maritime Service Details

Details

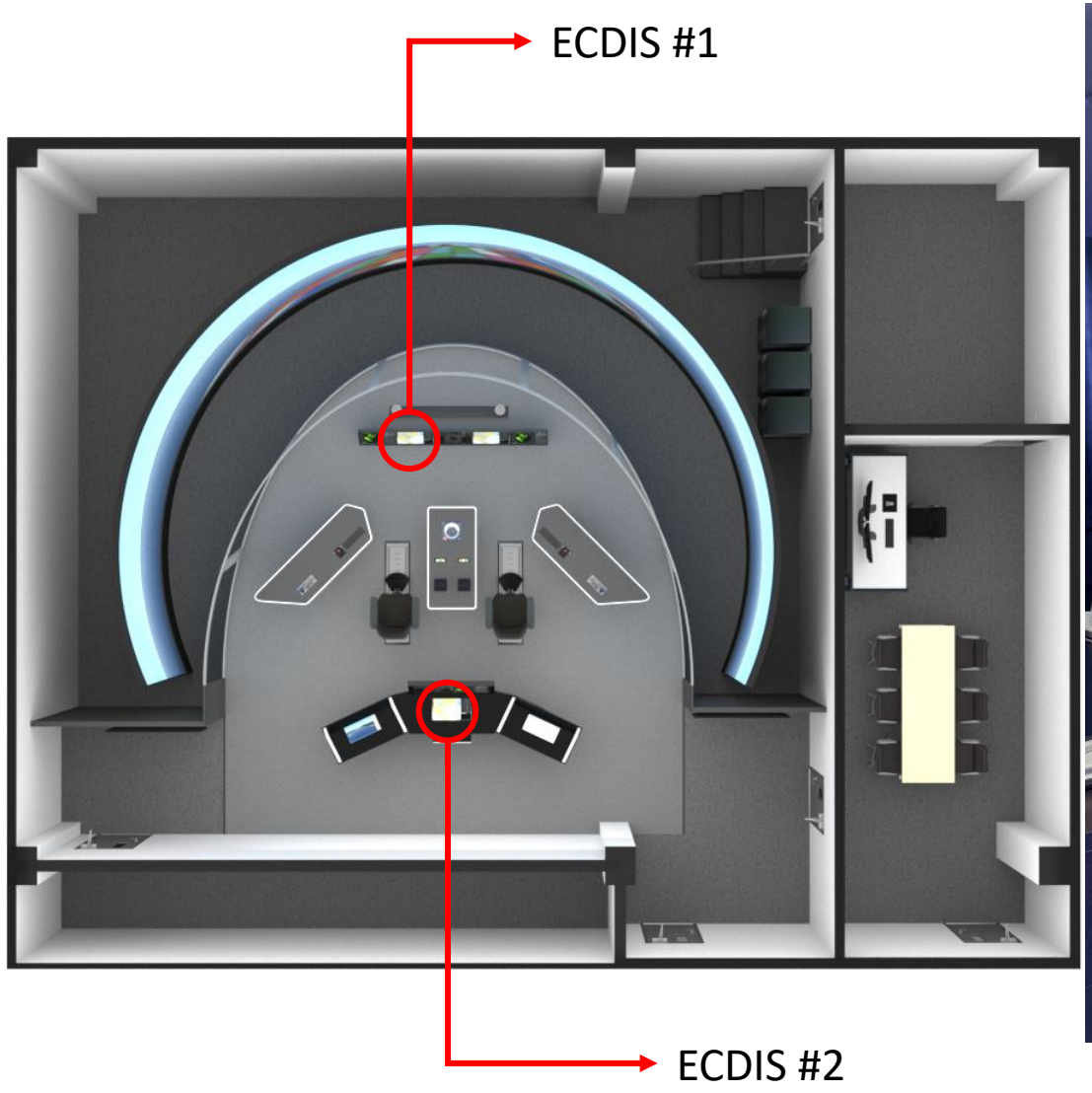
3 Vessel route exchange service

- A service analyzes navigational hazards around the route.
- Route information is provided in S-421 format.





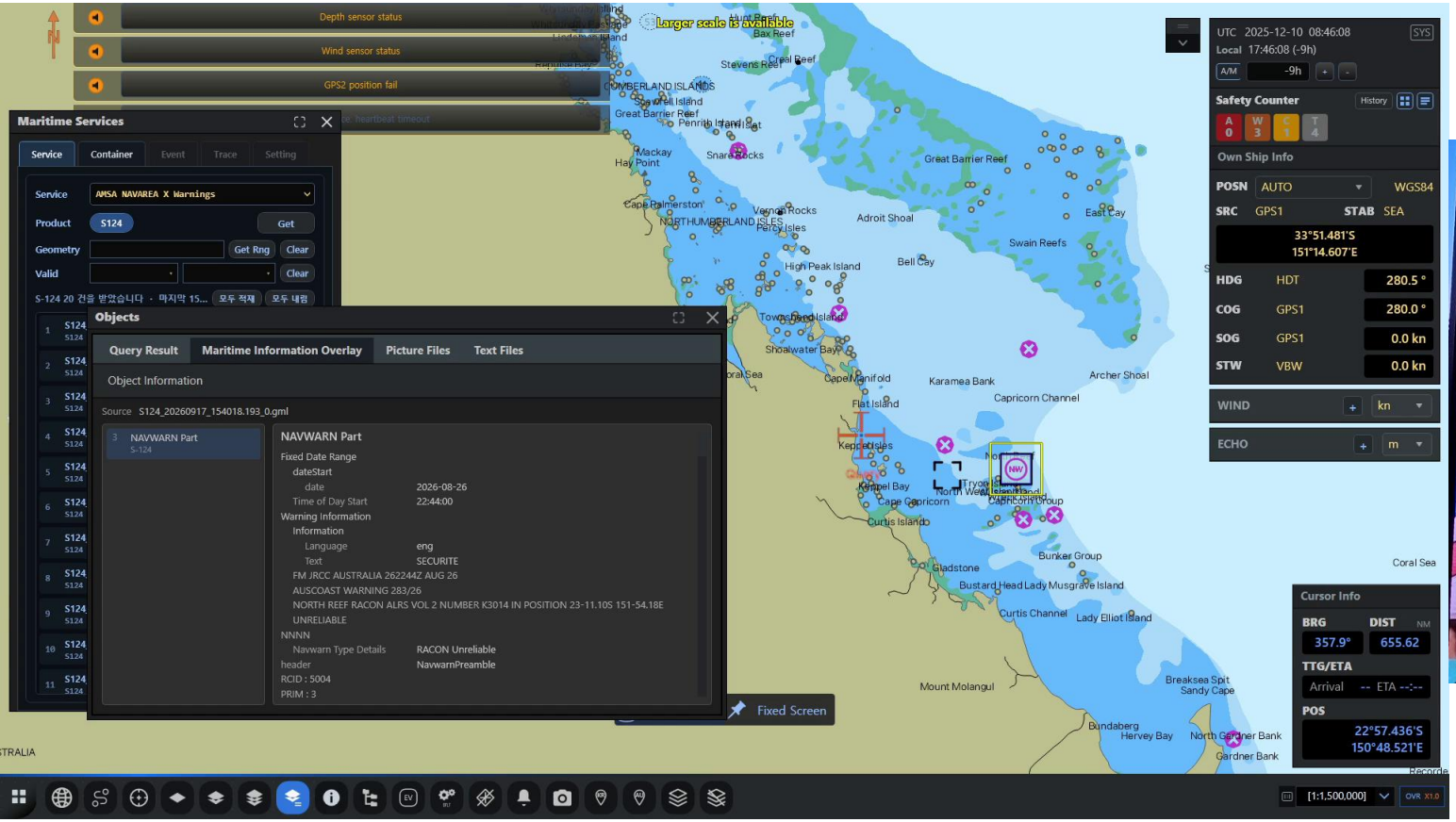
2.3 Full-Mission Bridge Simulation





2.4 Service Development (Navigational Warning)

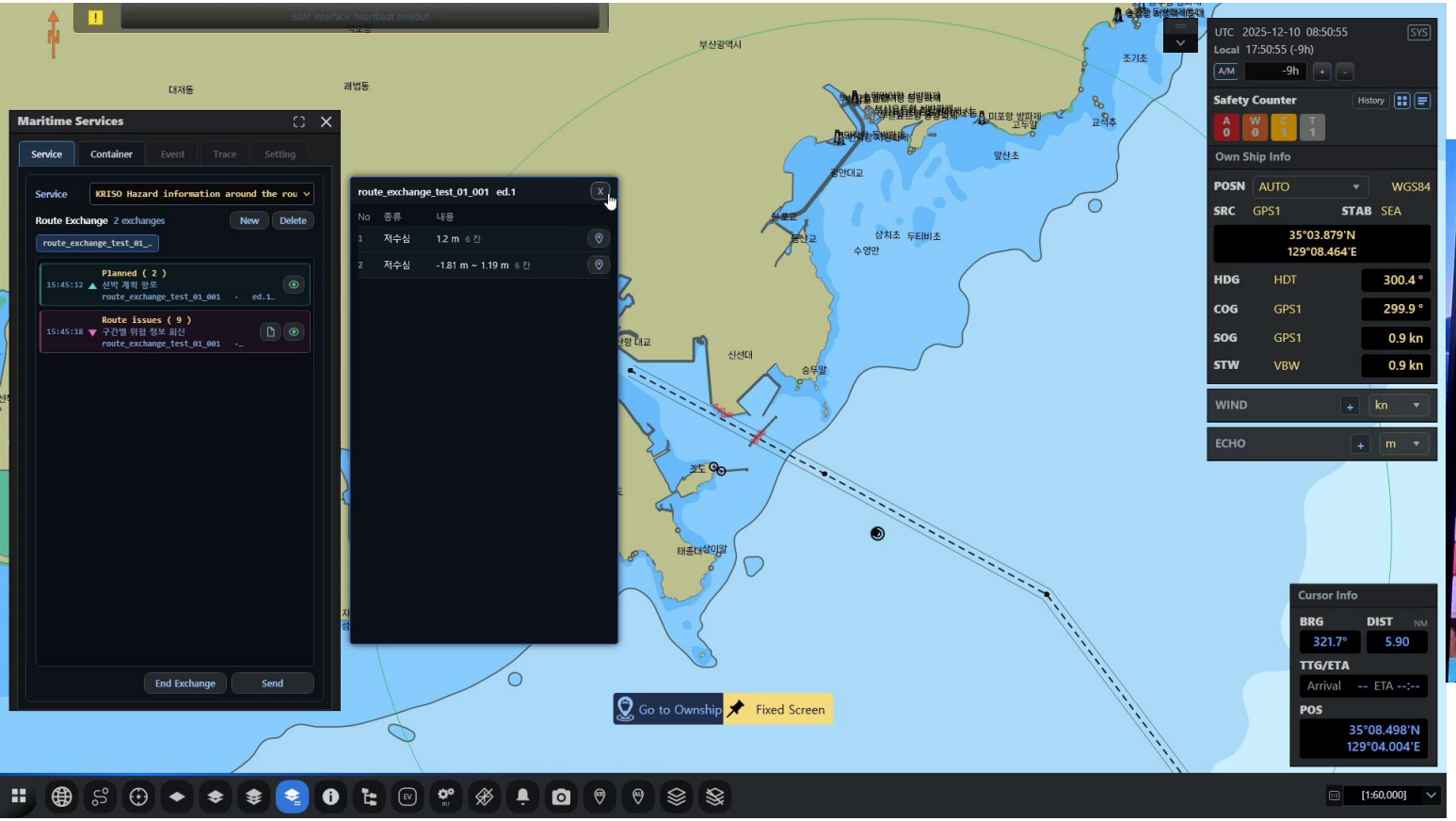
IHO Service Specification for the Provision of Navigational Warnings to End-users (v.0.996 2026.7)
IHO Service Design for the Provision of Navigational Warnings to End-users using SECOM (v.0.995 2026.7)





2.4 Service Development (Vessel Route Exchange)

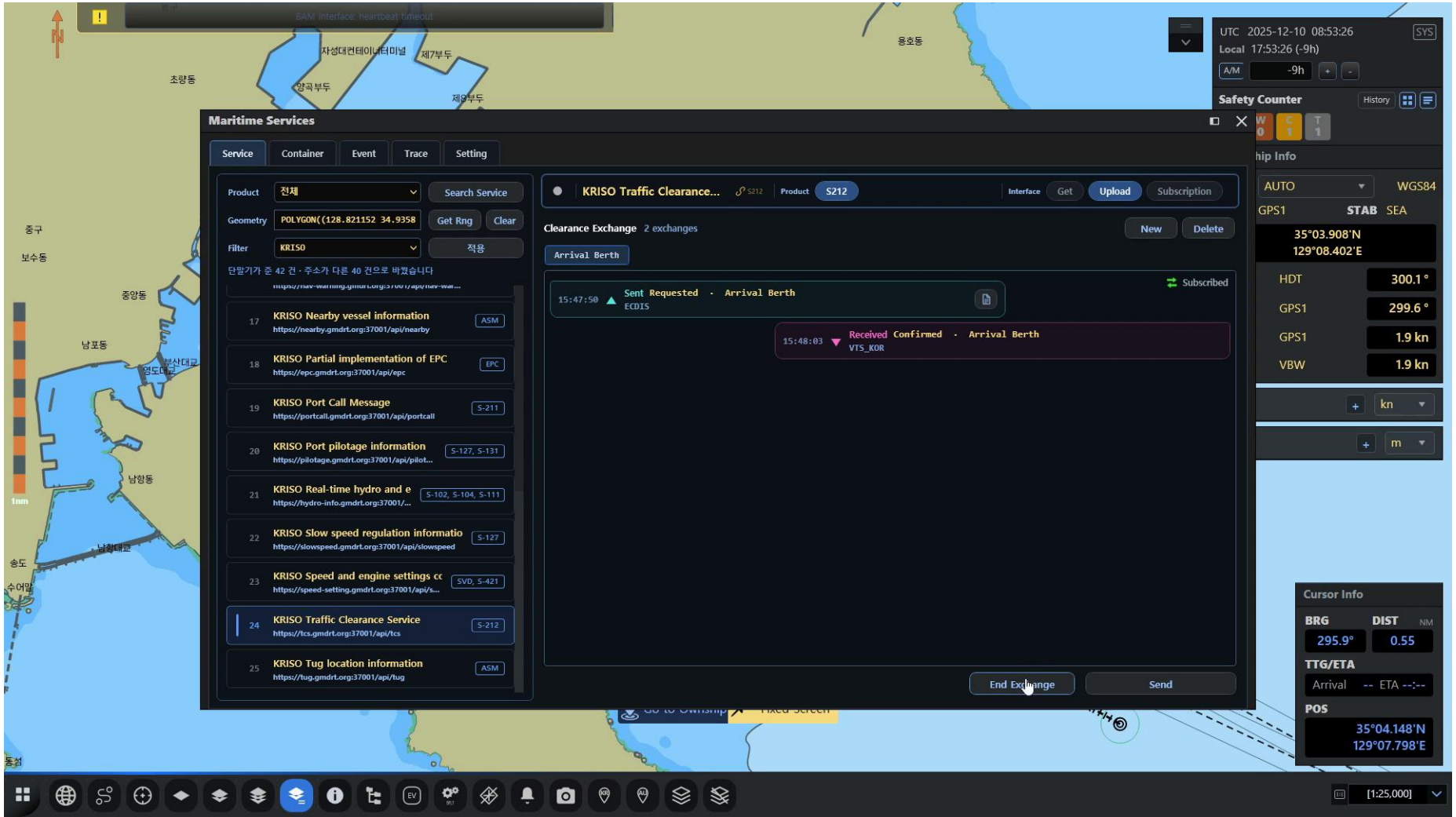
IALA SS0002 Service Specification for VTS - Vessel Route Exchange (Ed.1.2 2026.7)
IALA SD0002 Service Design for VTS – Vessel Route Exchange Service using SECOM (Ed.1.1 2025.4)



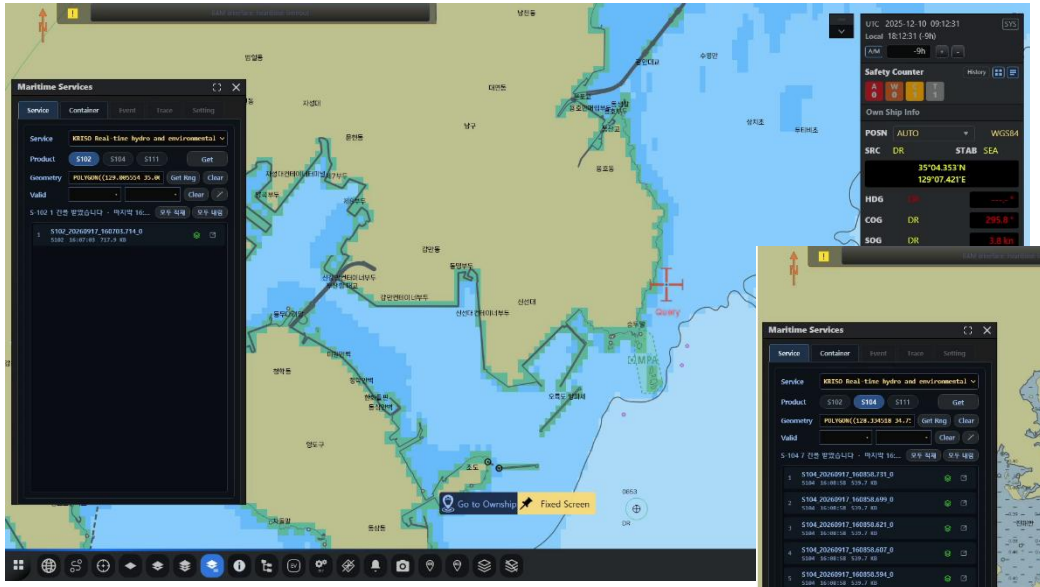


2.4 Service Development (VTS Traffic Clearance)

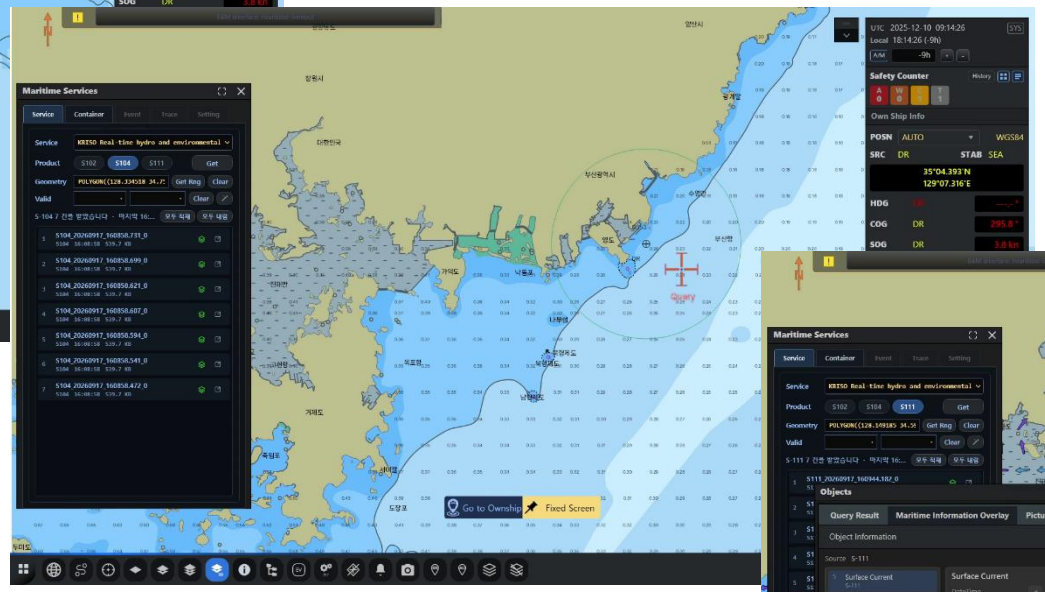
IALA SS0001 Service Specification for VTS Traffic Clearance (Ed.1.6 2026.3)
IALA SD0001 Service Design for VTS – VTS Traffic Clearance Service using SECOM (Ed.1.2.1 2025.4)



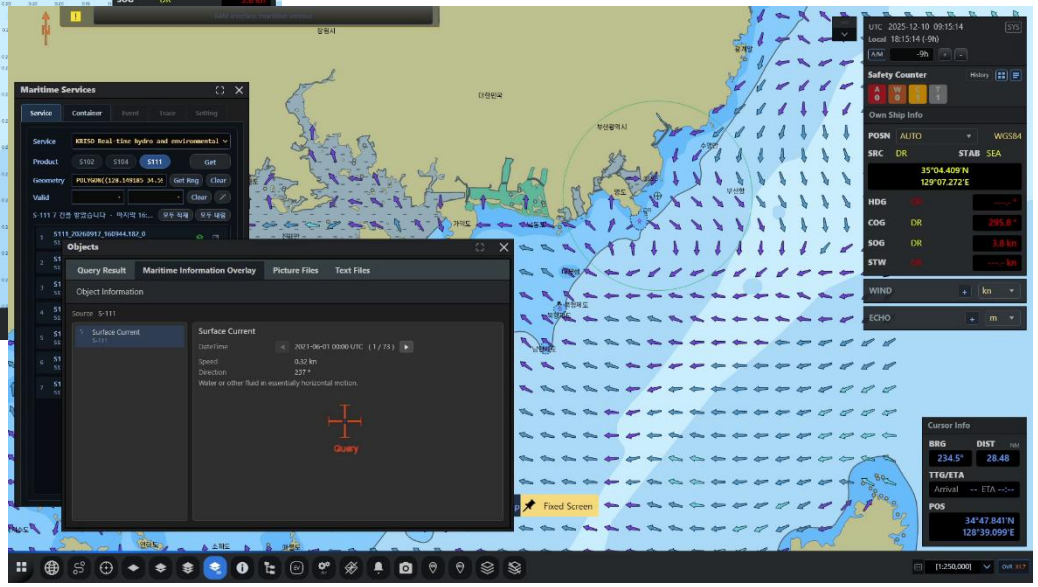
2.4 Service Development (Route Monitoring S-100 Products)



S-102 Bathymetric Surface

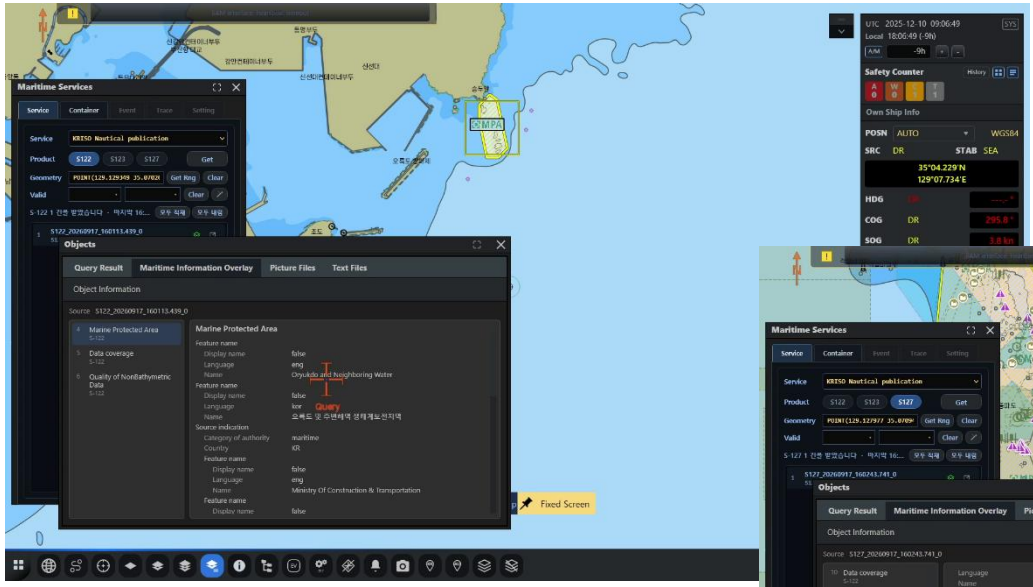


S-104 Water Level Information

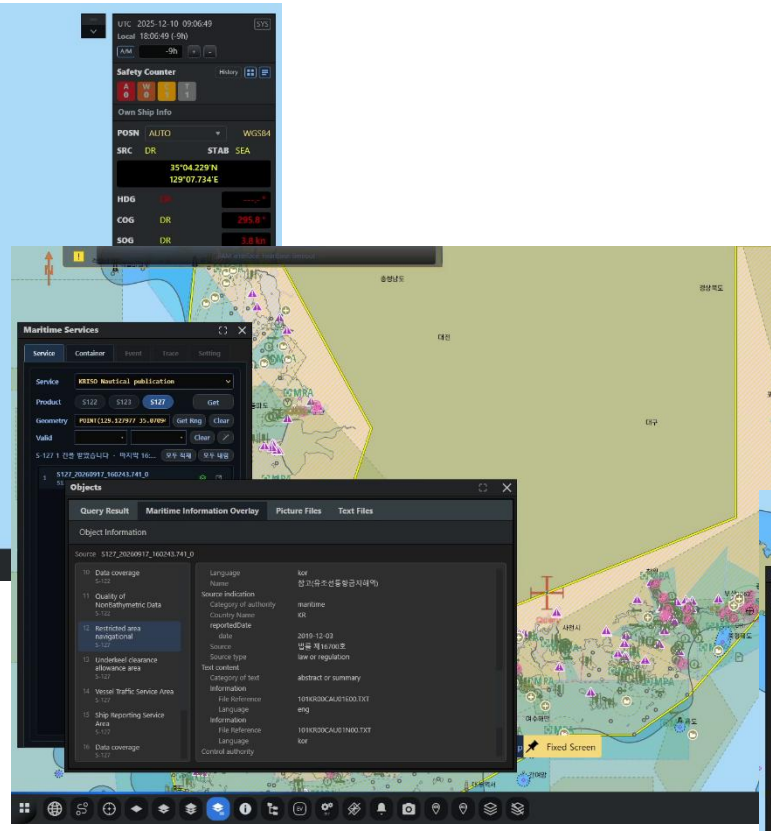


S-111 Surface Currents

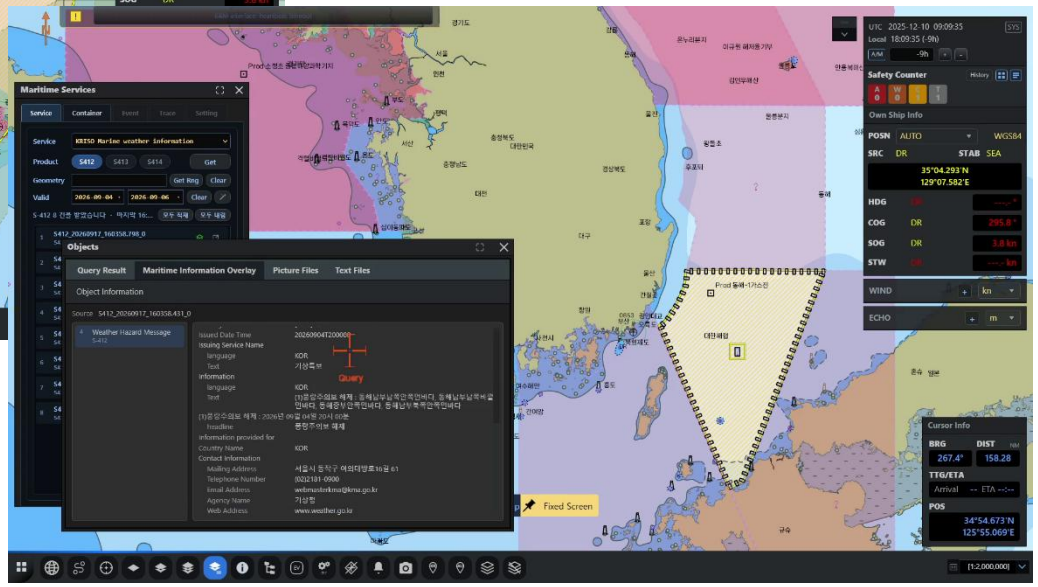
2.4 Service Development (Route Planning S-100 Products)



S-122 Marine Protected Areas



S-127 Marine Traffic Management



S-412 Marine Weather Warnings

2.5 Global Cooperation & Collaboration

Open Digital Incubator (ODI)

ODI Current Activities

- S-124 navigational warnings service
- S-125 AtoN information service
- S-212 VTS traffic clearance

DLR, Fintraffic, WÄRTSILÄ, Australian Government, KRISO, Swedish Maritime Administration, sternula, GRAD, NAVELINK, Danish Maritime Authority, AIVN Innovating Navigation, TST

» Share developments in digital services from Europe, Canada, and Australia, and collaborate to ensure compatibility.

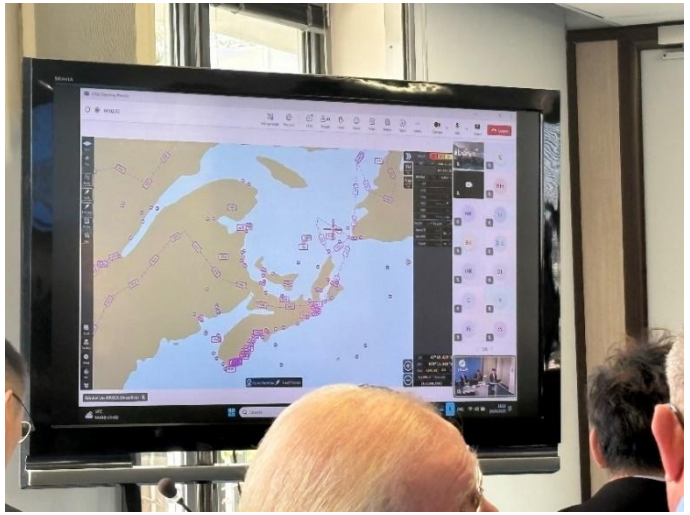
» Enhance services through the participation of maritime safety service entities (Canadian Coast Guard, Australian Maritime Safety Authority, etc.)

» It is expected that access to navigation warnings and maritime traffic control services in Australia, Europe, and other regions will be possible through ODI.

2.5 Global Cooperation & Collaboration

IALA VTS57/DTEC4 & IMO NCSR 12

- (2025) IALA Digital Technologies Committee (VTS57/DTEC4)
  - Demonstration of Maritime Safety Information (S-124) and VTS Traffic Reporting (S-212) services in cooperation with Korea and Europe
- (2025) IMO Sub-Committee on Navigation, Communications and Search and Rescue (IMO NCSR 12)
  - Demonstration of Maritime Safety Information (S-124) and Route Exchange (S-421) services in cooperation with Korea and Australia



IALA DTEC4 Demo



IMO NCSR 12 Demo

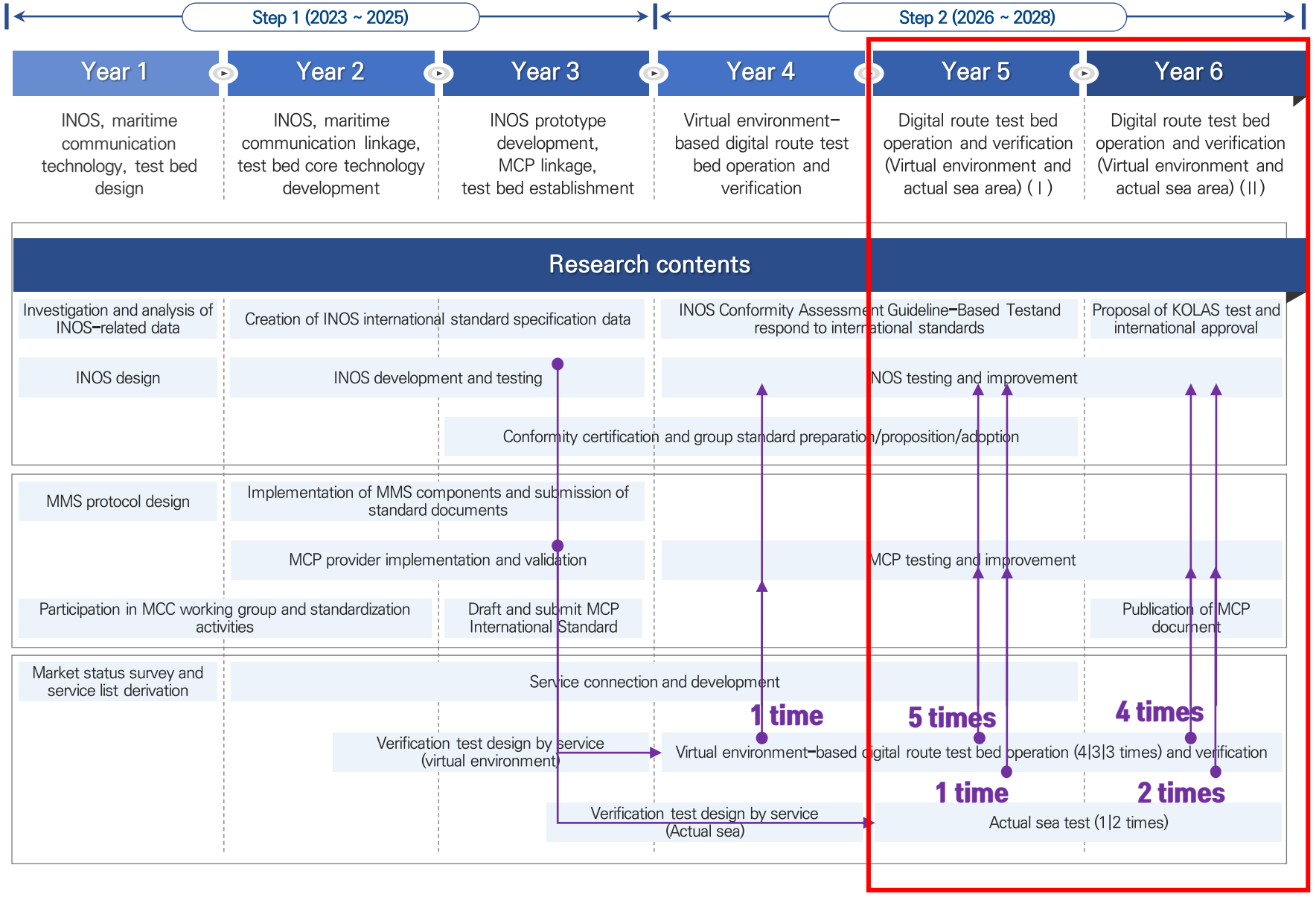
2.6 Roadmap

Research objective

Development of an integrated system that can use maritime digital route technology and services for international scale demonstration of digital maritime services

Detailed research contents

- (Group 1) International standard-based INOS (Intelligent Onboard System) prototype and standard
- (Group 2) Global maritime connectivity platform standard and technology
- (Group 3) Digital maritime service based on global testbed



3

Conclusion

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3. Conclusion

Technical Standards

- IHO S-100 Universal hydrographic data model
- IEC 63173-2 Ed.2 Secure communication between ship and shore (SECOM)
- Maritime Connectivity Platform (IALA, RTCM)

Service Provider

- NCSR 13 (2026) Guidance to establish a framework for data distribution and global IP-based connectivity between shore-based facilities and ships for ECDIS S-100 products
- IALA, IHO Guidelines for individual service design and specification

Service Consumer

- Res.MSC.530(106)/Rev.1 Performance standards for electronic chart display and information systems (ECDIS)

THANK YOU

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