Mastering Maritime Efficiency

Introduction to S-100

- S-100 History and Drivers for Development
- S-100 General Introduction
- S-100 Timeline
- S-100 Expected Benefits

Svein S. Skjaeveland

The DYNAPORT project – webinar: Digitalizing Nautical Communication Between Ship and Shore with S-100.
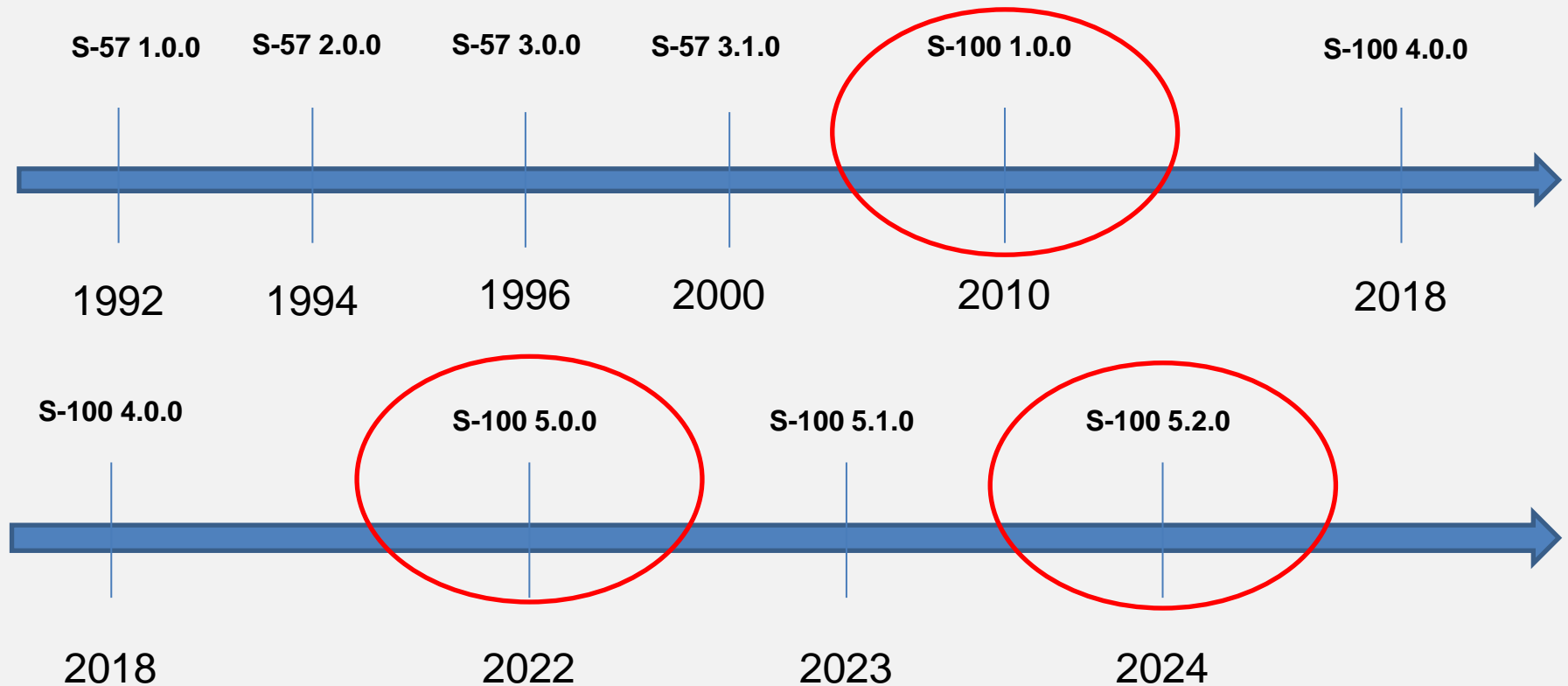
May 14 2024

- ❑ Svein Skjæveland
- ❑ Manager International Standardization
- ❑ Electronic Chart Centre (ECC)/PRIMAR

- ❑ Svein has been working with electronic navigational charts since 2003, starting out as an engineer at the Norwegian Hydrographic Service focusing on ENC, NTM updates and paper chart production. From 2006 employed by Electronic Chart Centre (ECC) working as Senior Geodata Consultant focusing on ENC validation and quality assurance. Svein currently holds a position as Manager of International Standardization and has been involved in standardization since 2009. He currently attends a number of IHO working groups representing PRIMAR.

S-100 History

- 1982 - Committee on the Exchange of Digital Data (CEDD) established
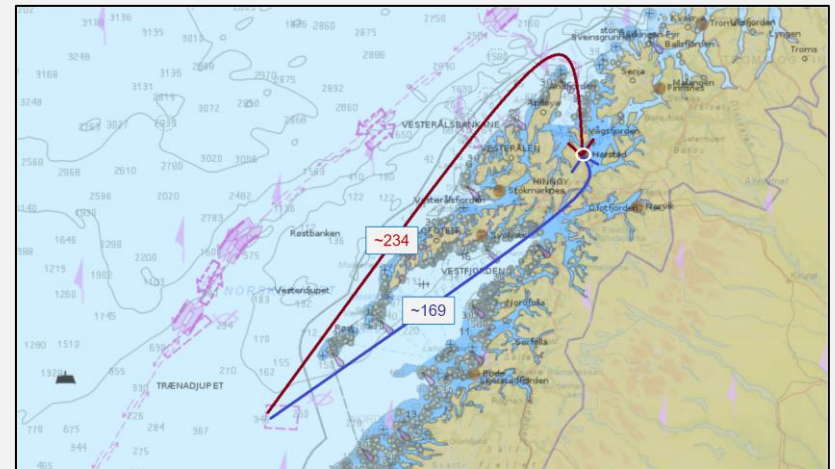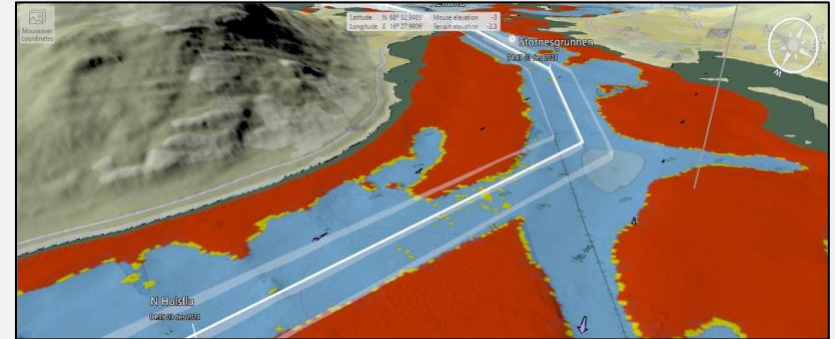- 1987 – DX87 released (originally known as CEDD format)
- 1990 – DX90 released

S-57 1.0.0	S-57 2.0.0	S-57 3.0.0	S-57 3.1.0	S-100 1.0.0	S-100 4.0.0
1992	1994	1996	2000	2010	2018

S-100 4.0.0	S-100 5.0.0	S-100 5.1.0	S-100 5.2.0
2018	2022	2023	2024

ELECTRONIC CHART CENTRE

Drivers for S-100 Development

❑ Limitations in S-57

    ❑ Frozen standard

    ❑ Inflexible maintenance regime

    ❑ Object/attribute catalogues integrated part of S57

        ❑ New obj/attr resulted in supplement

        ❑ New obj/attr - ECDIS software updates necessary

    ❑ Does not support future requirements – e.g. complex time varying information/gridded bathymetry etc...

    ❑ Limited standard – only for ENC in ECDIS

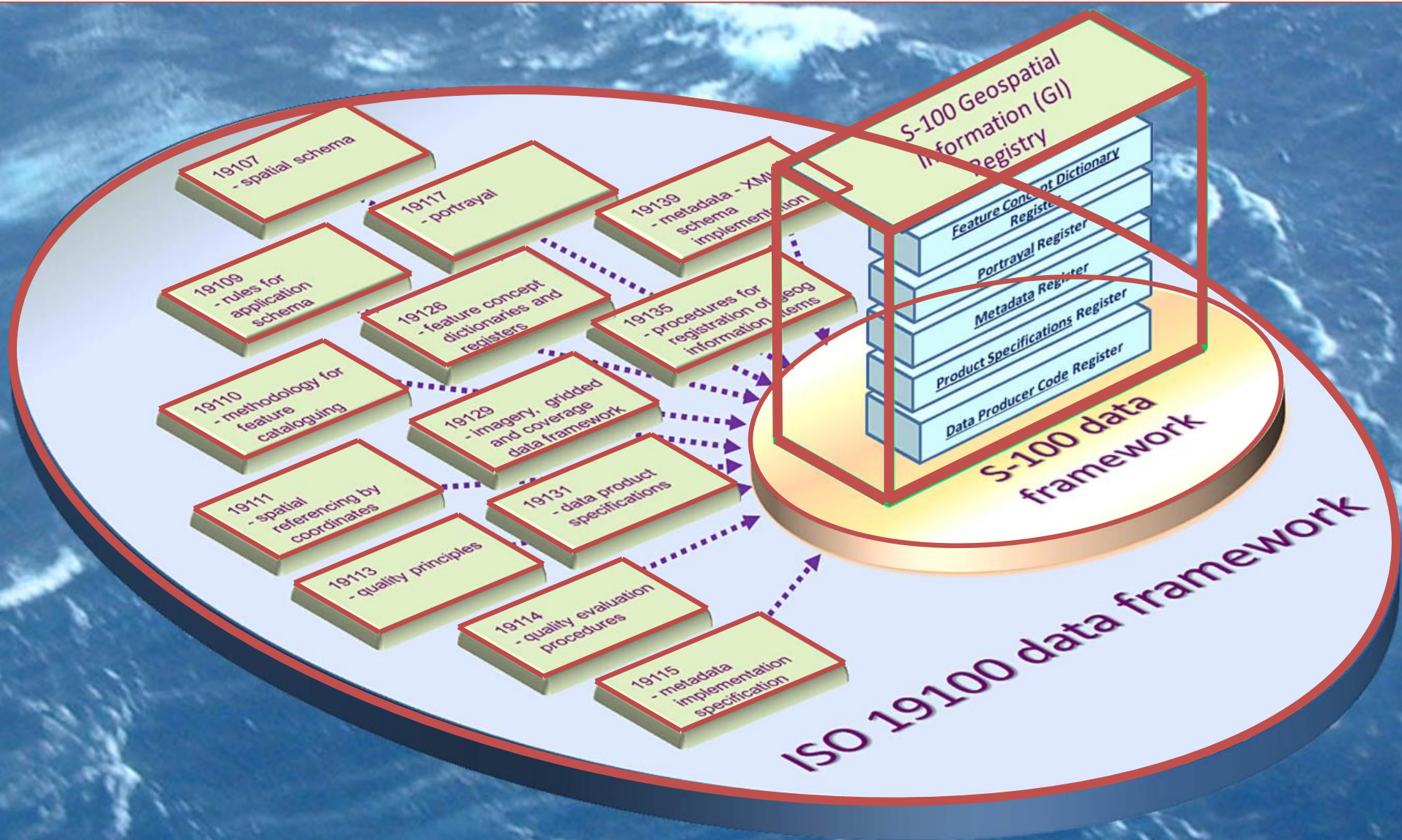   ❑ Data modell embedded in encapsulation/format.

Drivers for S-100 Development

❑ Technology driven
    ❑ Autonomous navigation.
    ❑ Cyber security expectations.
    ❑ Interoperability advantages.
    ❑ Service efficiency.
❑ Economical benefits.
❑ Environmental benefits.
❑ Navigational Safety benefits.

- 65 NM less distance.
- (65 NM x 5) x 12 = 3900 NM.
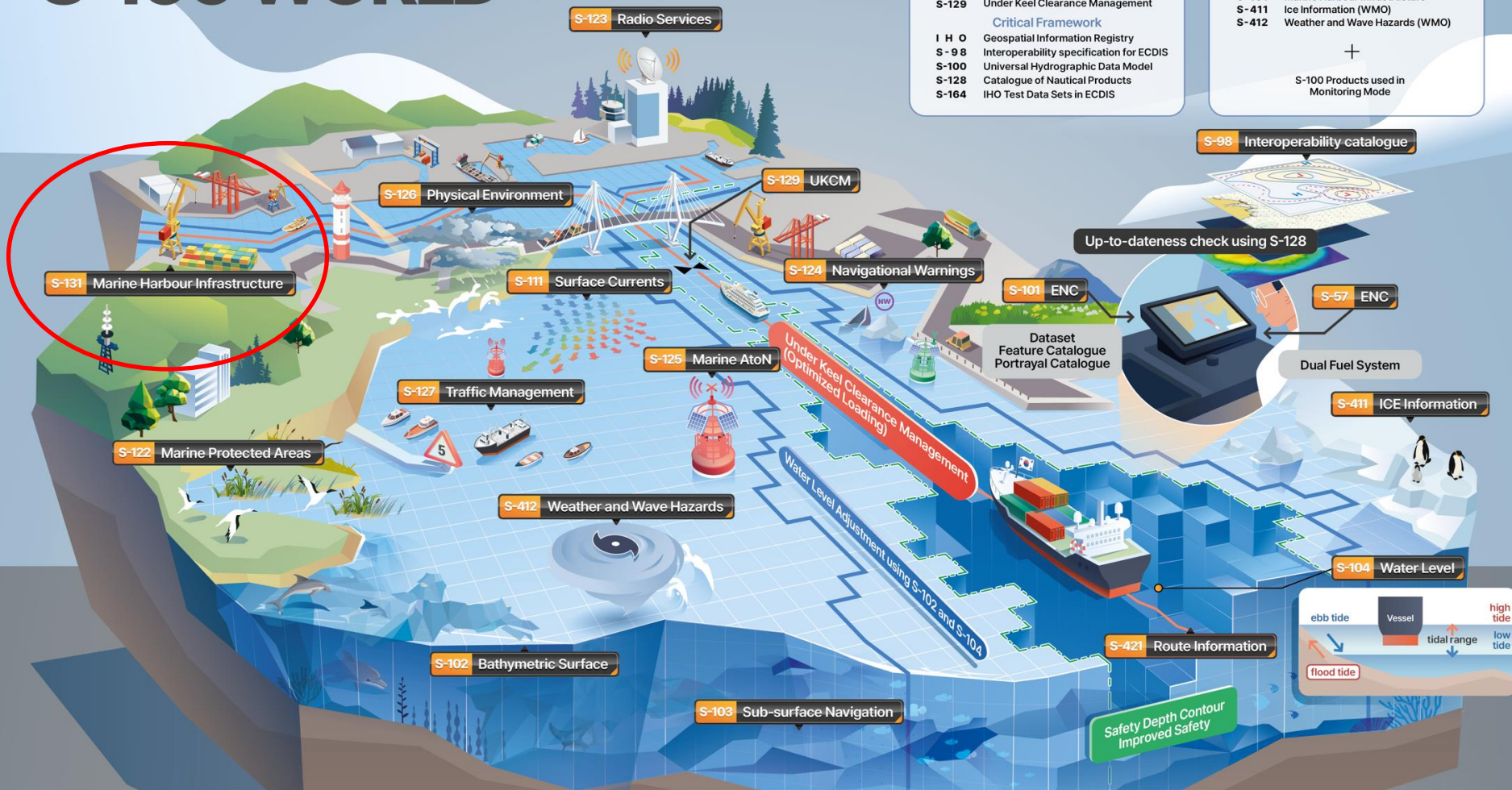- Approx. 330 ton CO_2 reduction.

S-100 Introduction

S-100 Content

S-100 WORLD

Phase 1
Route Monitoring

S-101	Electronic Navigational Chart
S-102	Bathymetric Surface
S-104	Water Level for Surface Navigation
S-111	Surface Currents
S-124	Navigational Warnings
S-129	Under Keel Clearance Management

Critical Framework

I H O	Geospatial Information Registry
S-98	Interoperability specification for ECDIS
S-100	Universal Hydrographic Data Model
S-128	Catalogue of Nautical Products
S-164	IHO Test Data Sets in ECDIS

Phase 2
Route Planning

S-122	Marine Protected Areas
S-123	Marine Radio Services
S-125	Marine Aids to Navigation
S-126	Marine Physical Environment
S-127	Marine Traffic Management
S-131	Marine Harbour Infrastructure
S-411	Ice Information (WMO)
S-412	Weather and Wave Hazards (WMO)

+

S-100 Products used in Monitoring Mode

S-123 Radio Services

S-126 Physical Environment

S-129 UKCM

S-98 Interoperability catalogue

Up-to-dateness check using S-128

S-124 Navigational Warnings

S-131 Marine Harbour Infrastructure

S-111 Surface Currents

S-101 ENC

S-57 ENC

Dataset
Feature Catalogue
Portrayal Catalogue

Under Keel Clearance Management (Optimized Loading)

S-125 Marine AtoN

Dual Fuel System

S-127 Traffic Management

S-411 ICE Information

S-122 Marine Protected Areas

Water Level Adjustment using S-102 and S-104

S-412 Weather and Wave Hazards

S-104 Water Level

ebb tide | Vessel | high tide
tidal range | low tide
flood tide

S-102 Bathymetric Surface

S-421 Route Information

S-103 Sub-surface Navigation
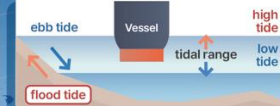
Safety Depth Contour
Improved Safety

| S-97	Guidelines for Creating S-100 Product Specifications	S-98	Data Product Interoperability in S-100 Navigational System	S-99	Operational Procedures for the Organization and Management of the IHO GI registry	S-100	IHO Universal Hydrographic Data Model	S-164	Test Data Set for S-100 and ECDIS Type Approval	S-101 to S-199	International Hydrographic Organization (IHO)
S-201 to S-299	International Association of Marine Aids to Navigation and Lighthouse (IALA)	S-301 to S-399	Intergovernmental Oceanographic Commission (IOC)	S-401 to S-402	Inland ENC Harmonization Group (IEHG)	S-411 to S-414	WMO Service Commission (SERCOM)	S-421 to S-430	International Electrotechnical Commission - TC80 (IEC-TC80)	S-501 to S-525	NATO Geospatial Maritime Working Group (GMWG) for Additional Military Layers (AML)

S100 Timeline for prioritized Product Specifications
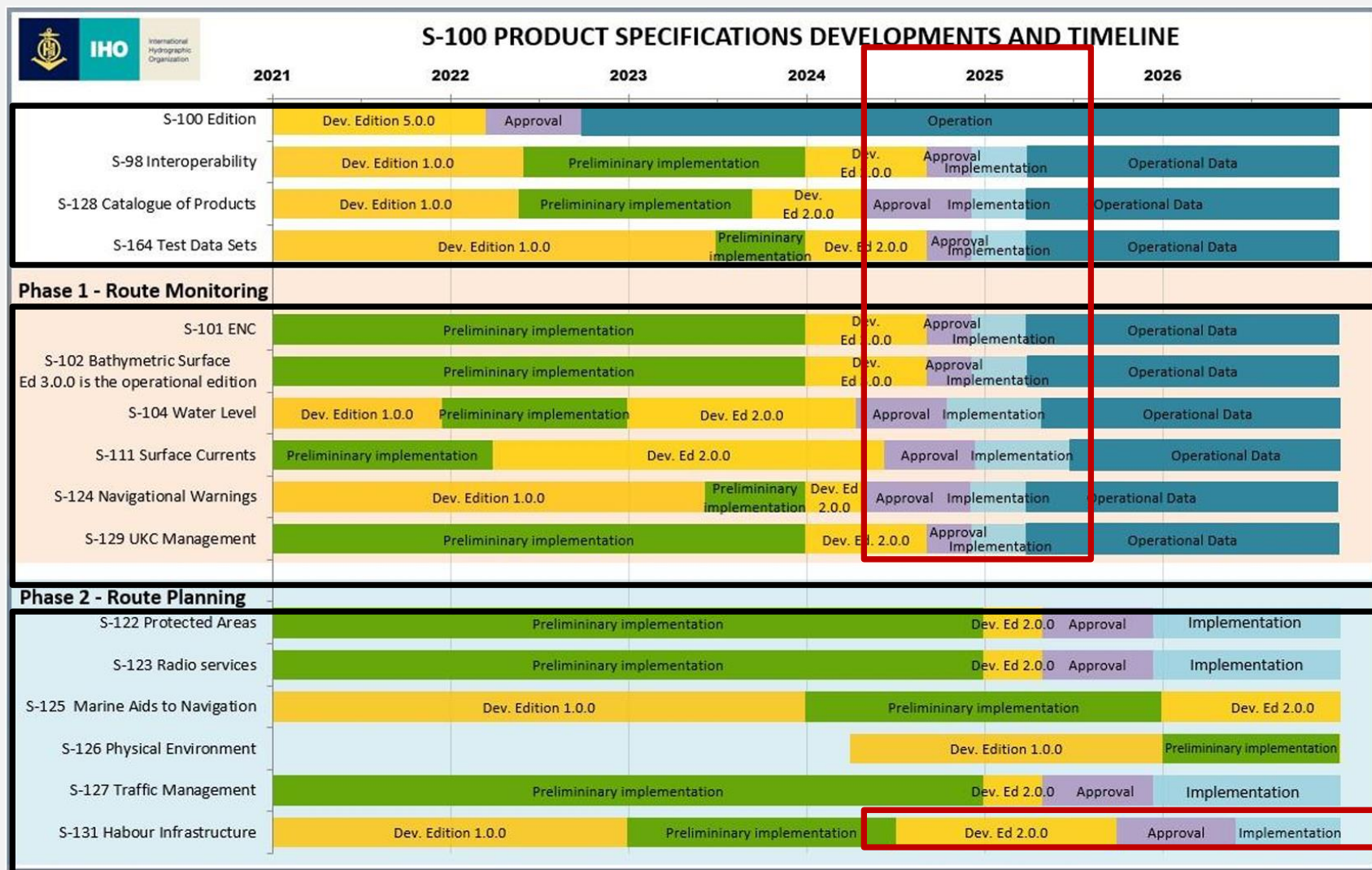
S-100 General benefits

❑ S-100 compatability:
  ❑ Collection, refinement, analysis, access and presentation of data.
❑ Wider use beyond HOs and ECDISes
  ❑ Coastal zone mapping, Maritime analyzis etc.
❑ Data update and symbology plug-and-play.
❑ Supports both static and dynamic dataflows
  ❑ Time varying information (x, y, z and time).
❑ Data content not embedded in file format
❑ Flexible Maintenance
  ❑ Clarification, Revision and New Edition.
❑ Improved metadata
❑ Multiple product packaging and delivery
❑ Enhanced Security Scheme

S-100 ECDIS specific benefits

❑ Multiple product portrayal and interoperability.

❑ Enhanced and improved Pick Report information.

❑ Improved Check Update functionality.

❑ Enhanced portrayal and use of Quality information.

❑ Automated updating of Portrayal and Feature catalogues (plug and play).

❑ Multiple product installation from single source.

❑ Reduced alarms

S-100 ECDIS og WLA

- ❑ Water Level Adjustement (WLA)
- ❑ Single layer official S-57 ENC replaced by multiple, interacting layers of navigational data.
- ❑ **Safety contour calculations based on S-102.**
  - ❑ **adjusted for water level information.**
  - ❑ dynamic - real time and/or forecasted information.
  - ❑ **S-101 ENC + S-102 Gridded bathymetry + S-104 Water Level gives a fundamental "depth" against which UKC and Vertical Clearance can be measured and managed on the S-100 ECDIS.**
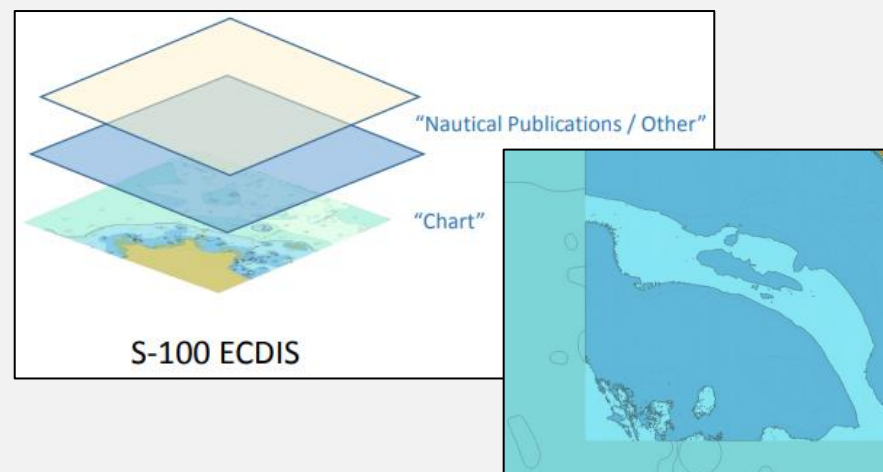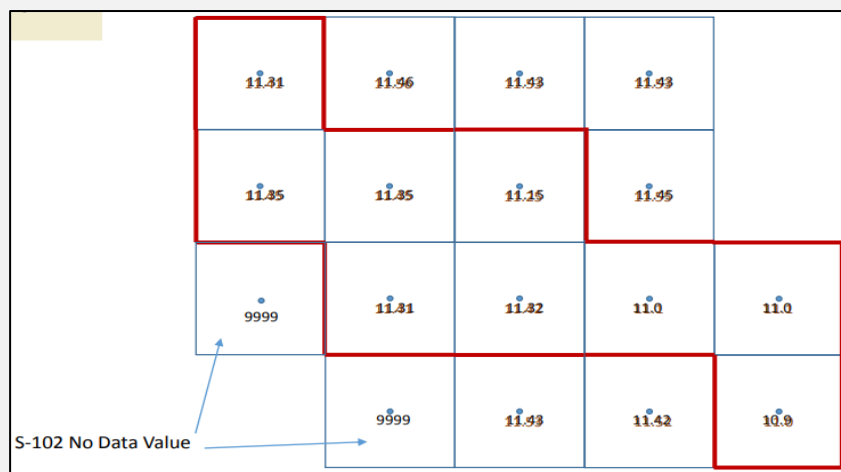
S-100 ECDIS og WLA

❑ Example: S-98 defines how to apply Water Level Adjustment using S-104

S-104 Depth Value = 0.1m

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.
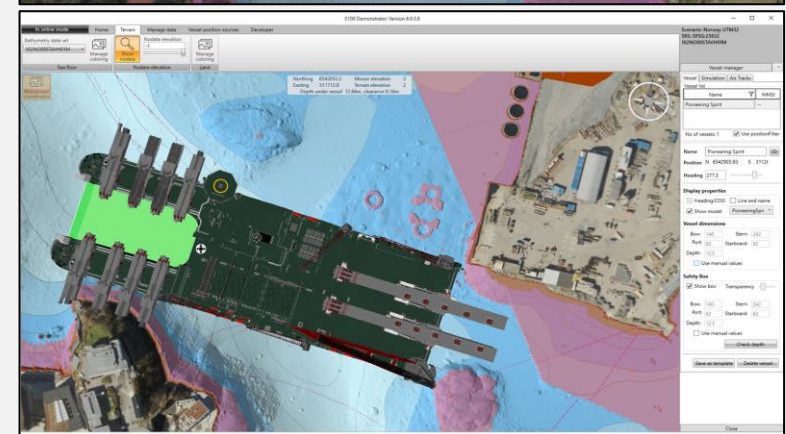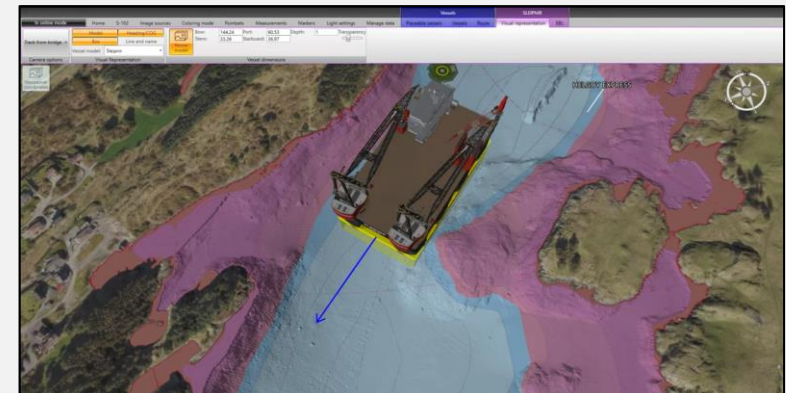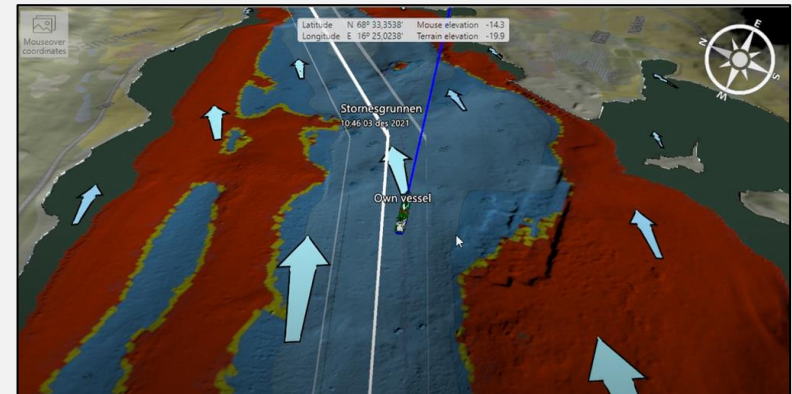

S-102 No Data Value
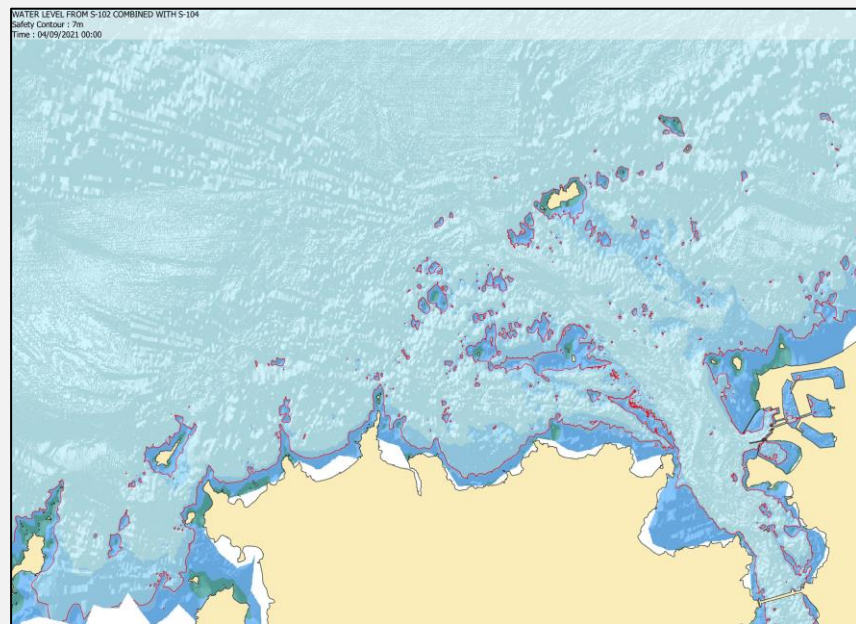
S-102 Data (Suppressing S-101 Depth Areas)

S-102 + S-104 Water Level Data (Water Level Corrected Depths)

User Selected Safety Contour Value = 11.5m

S-100 Major benefits

❑ Water Level Adjustment

❑ User Selected Safety Contour

❑ Improved Safety

❑ Optimized Loading

❑ Route Optimization and Just In Time Arrival

❑ Security

❑ Automated Navigation

Thank you for your attention

Resources:
IHO S-100 Universal Hydrographic Data Model introduction:
https://iho.int/en/introduction-0

IHO S-100 Implementation Strategy:
https://iho.int/en/s-100-implementation-strategy

PRIMAR S-100:
https://www.primar.org/#/S-100

ECC S-100
https://info.ecc.no/s-100-data-and-products

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