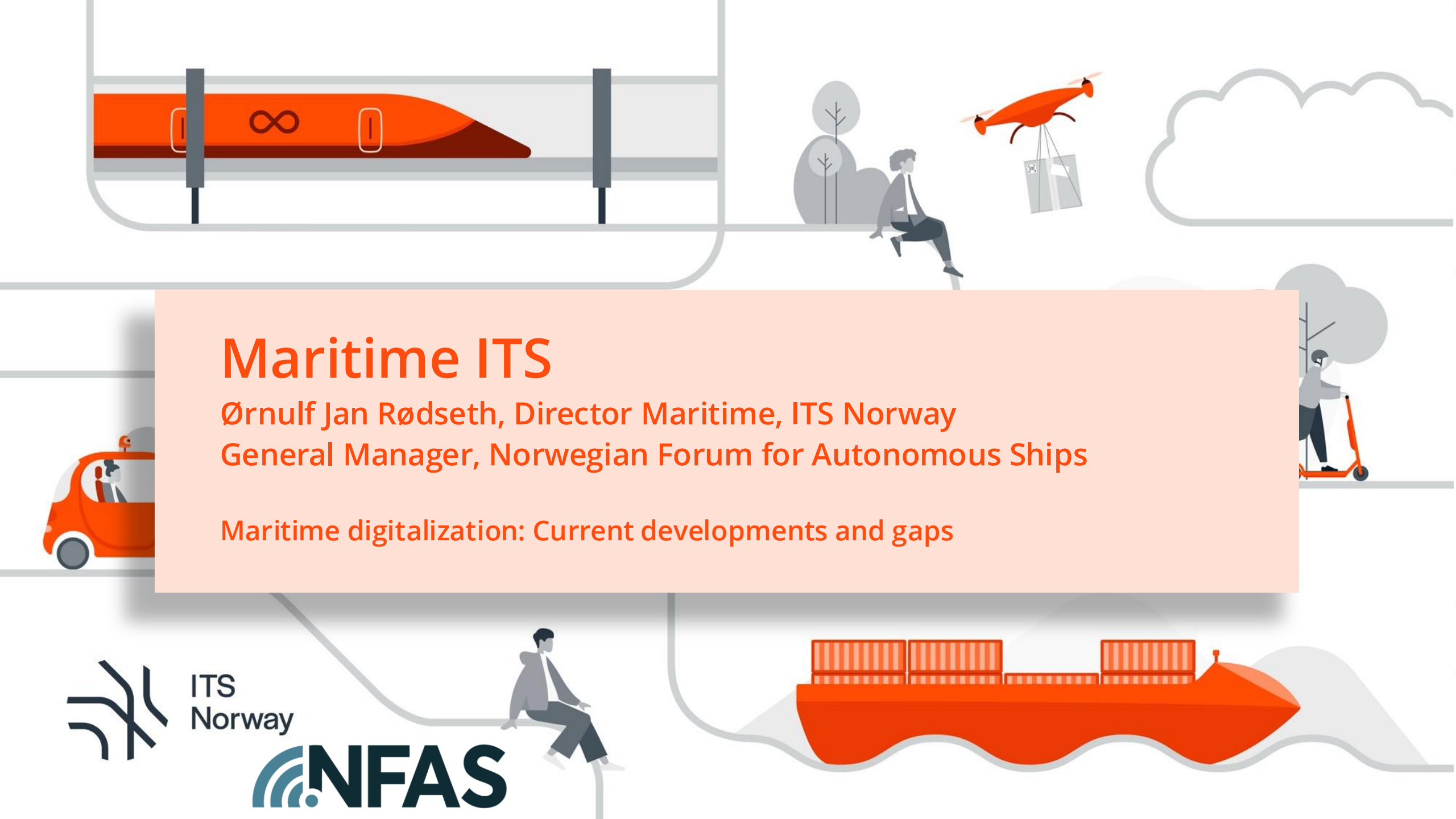




Maritime ITS

Ørnulf Jan Rødseth, Director Maritime, ITS Norway
General Manager, Norwegian Forum for Autonomous Ships

Maritime digitalization: Current developments and gaps



ITS
Norway



Based on results from ISTS and DYNAPORT

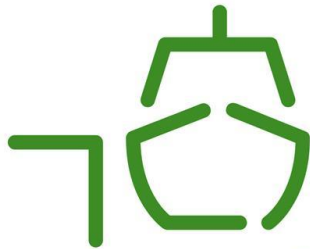


Intelligent Ship Transport System

<https://ists.mits-forum.org/>

Maritime ICT Architectures and Standards

<http://ists.mits-forum.org/resources.html#H1>



DYNAPORT

DYNAMIC NAVIGATION AND PORT CALL OPTIMISATION IN REAL TIME

<https://dynaport.eu/>

Maritime ITS and need for digitalization

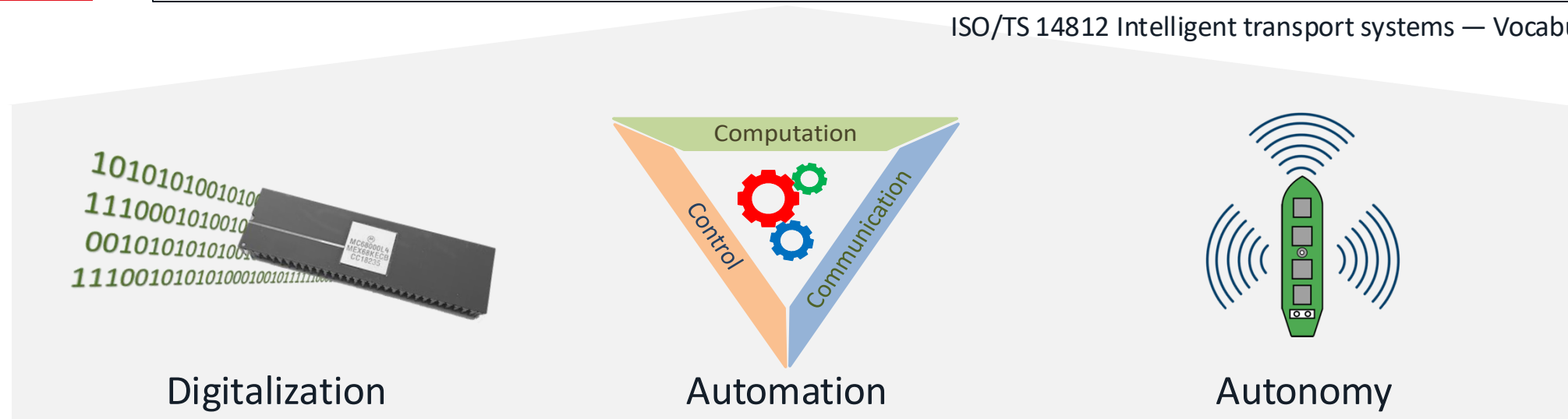
Maritime ITS



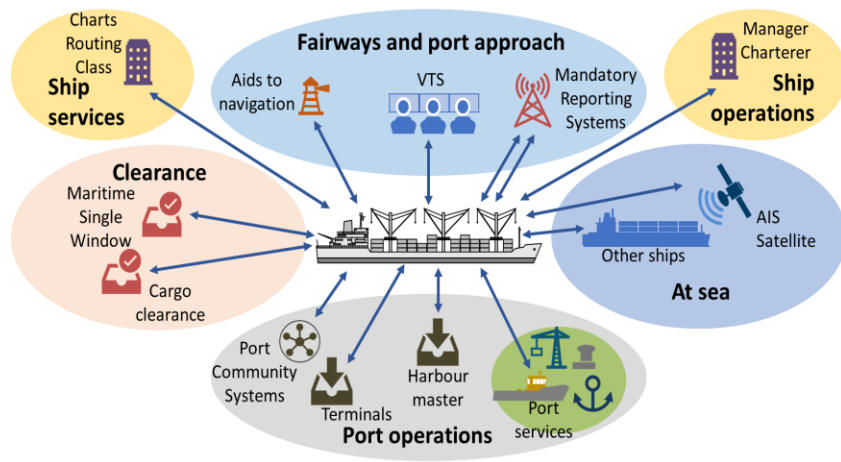
intelligent transport system

system comprised of information, communication, sensor and control technologies and that is designed to benefit a surface transport system

ISO/TS 14812 Intelligent transport systems — Vocabulary



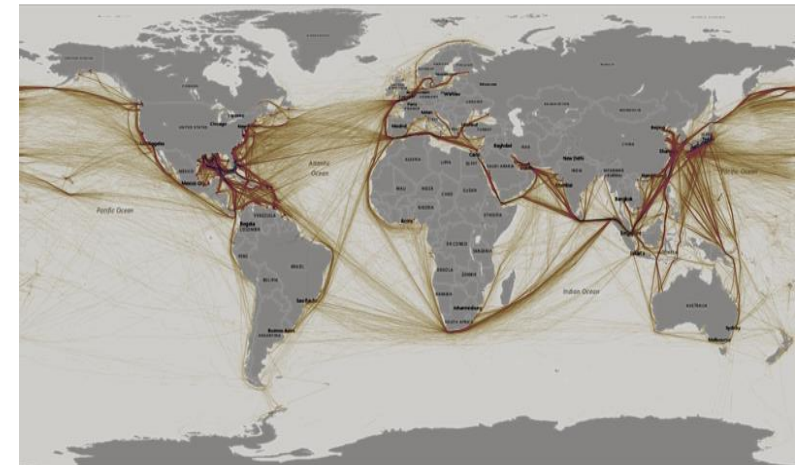
Dependent on digitalization and standards



Communication and digitalization



Standards

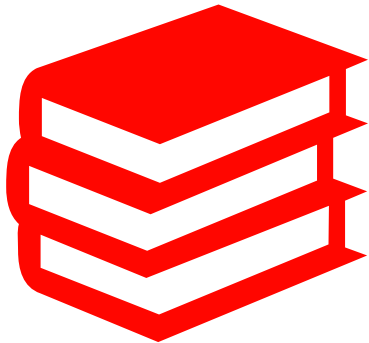


International consensus

About standards

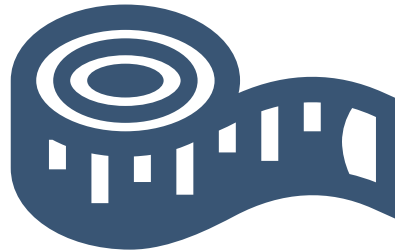
Different types of standards

Conformance



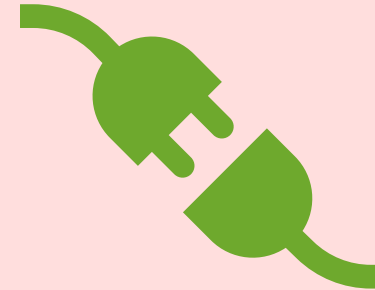
Conformant to specifications or regulations.

Performance



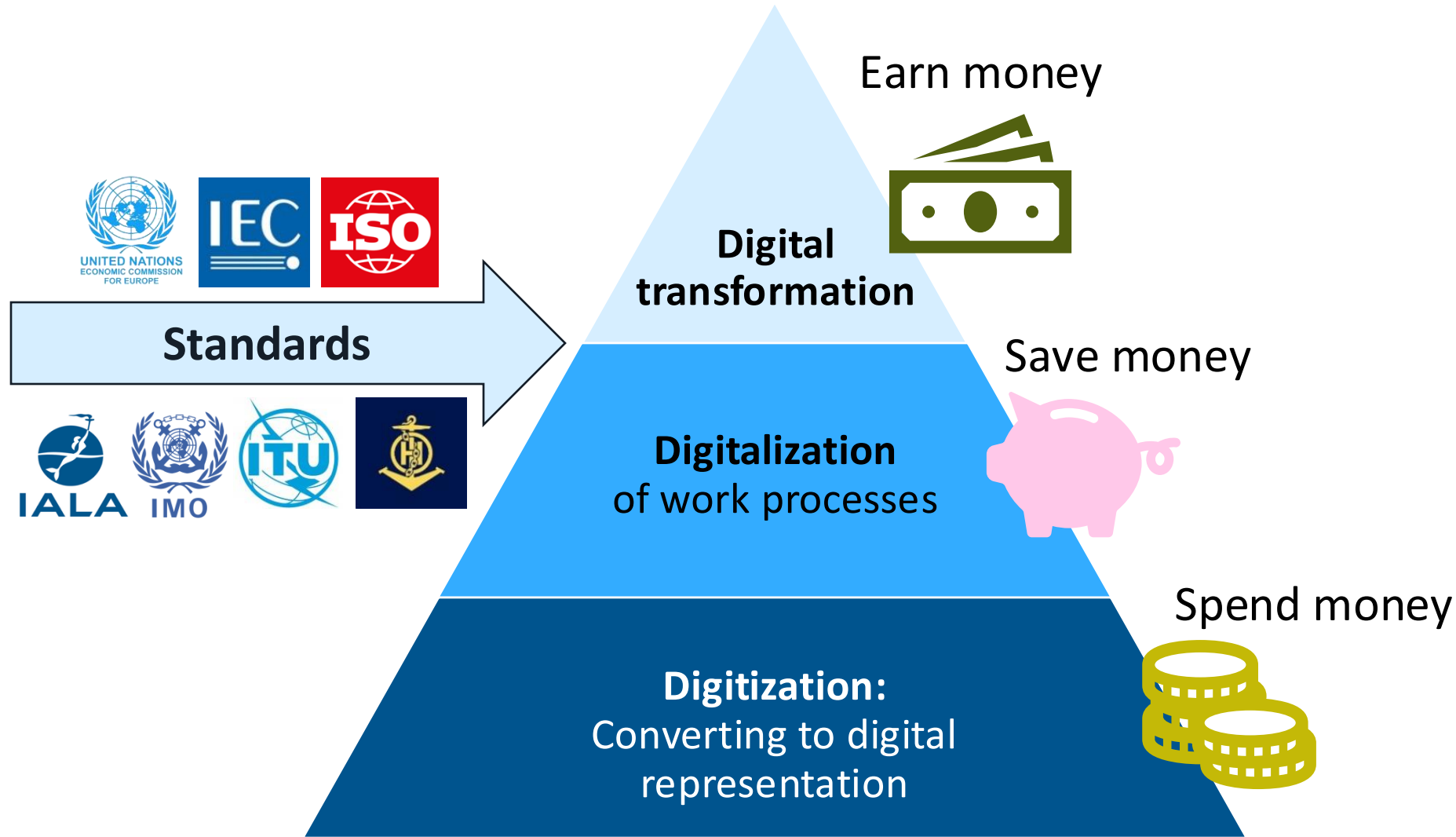
Guarantee that a system has a certain performance.

Interoperability



Guarantee that systems can operate or work together.

Standards: From digitalization to digital transformation



The standards landscape

Three silos in maritime digitalization



The nautical standards landscape



IMO MSC: Maritime Safety Committee
NCSR: Navigation, communication, search and rescue

DTEC: Digital technologies
VTS: Vessel traffic services

NIPWG: Nautical Information Provision Work Group

TC80: Maritime navigation and radiocommunication
equipment and systems

e-navigation
VDES, SECOM

e-navigation++
MCP

S-100 data model
S-100 products

IEC 61162
SECOM

The administrative standards landscape



IMO FAL: Facilitation Committee

MSW, IMO
Compendium



Standards mainly for authorities – not end users

WCO data model



Trade- and transport-related standards

EDIFACT
MMT RDM



TC8: Operative and technical standards

ISO 28005

The operative standards landscape



TC8: Operative and technical standards

Trade- and transport-related standards

EDI for container sector - EDIFACT

EDI for container sector – JSON/API

TC8: Ships and marine technology

Identity codes – geographic locations

ISO 19847/48
ISO 4891, ISO 28005

EDIFACT
MMT RDM

BAPLIE, VERMAS, ...

Booking, JIT, BoL ...

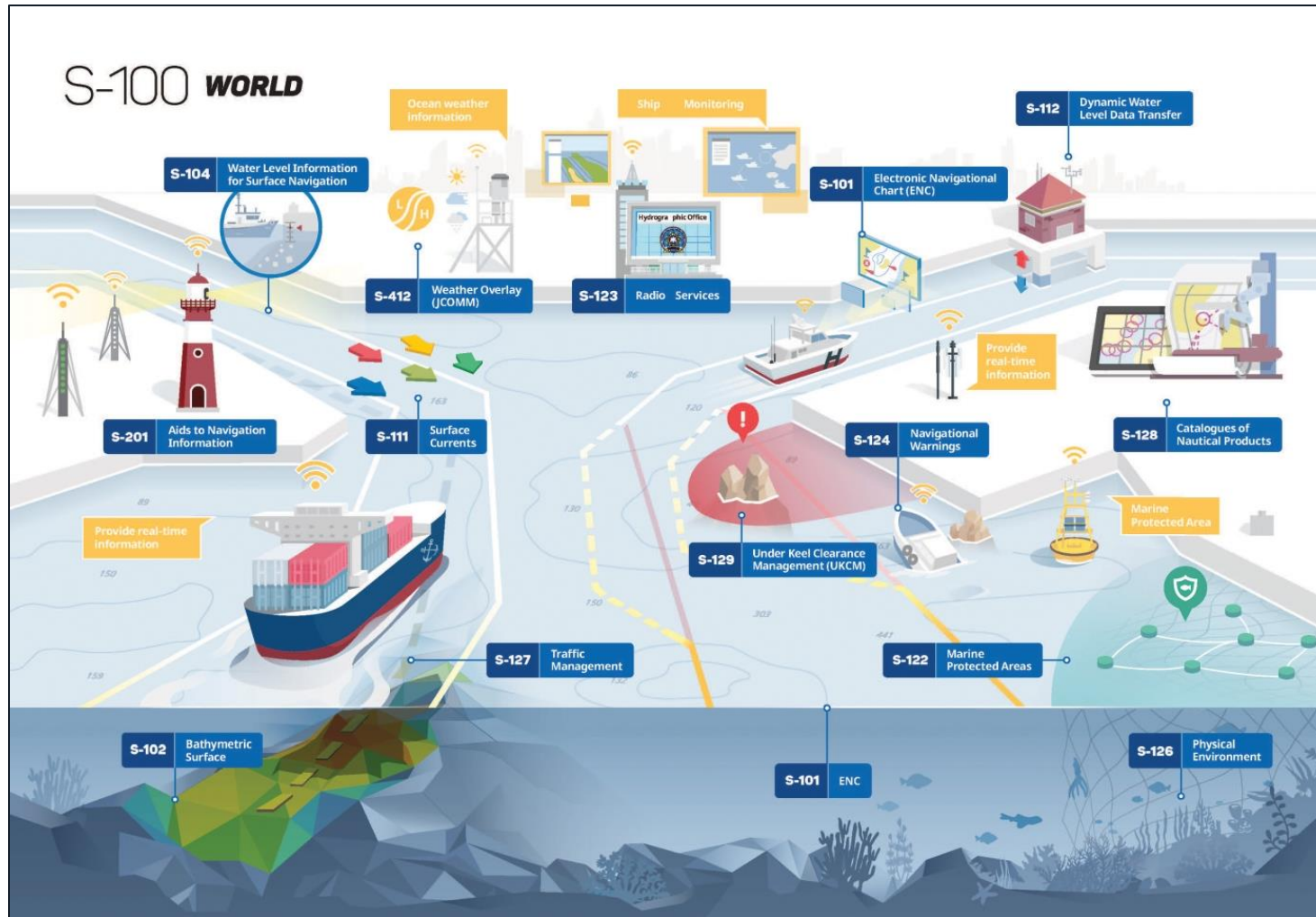
Data models, terminal
equipment

GLN



E-navigation and controlled networks

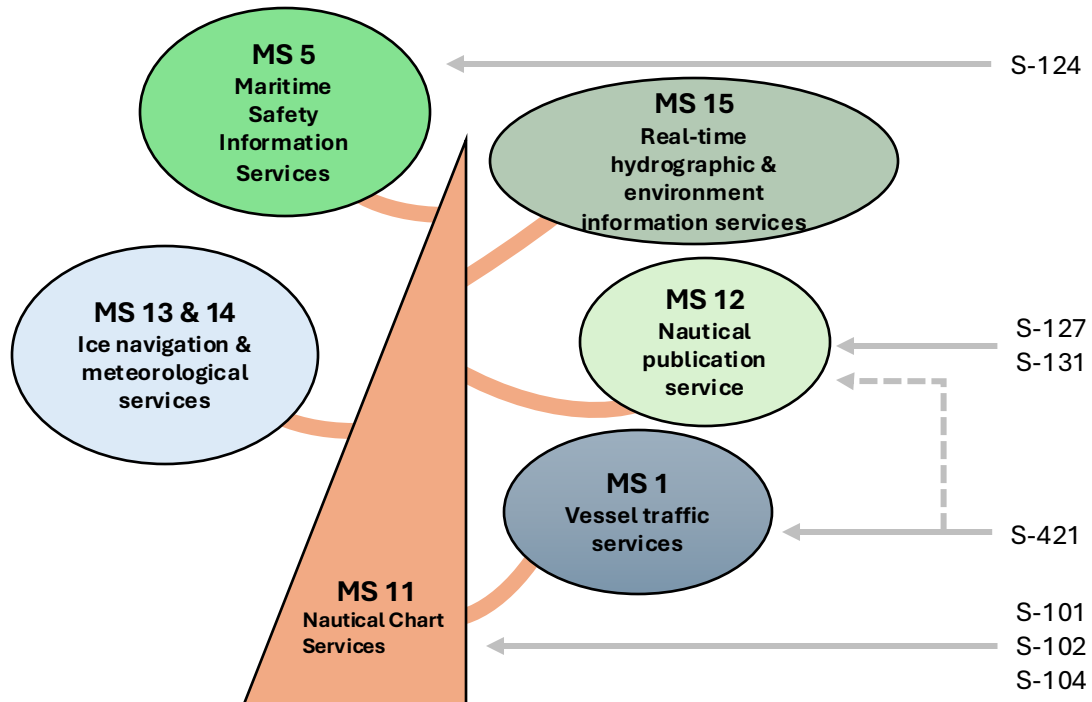
E-navigation and transfer to S-100



e-navigation is the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.

MSC.1/Circ.1595 - E-NAVIGATION STRATEGY
IMPLEMENTATION PLAN – UPDATE 1, 25 May
2018

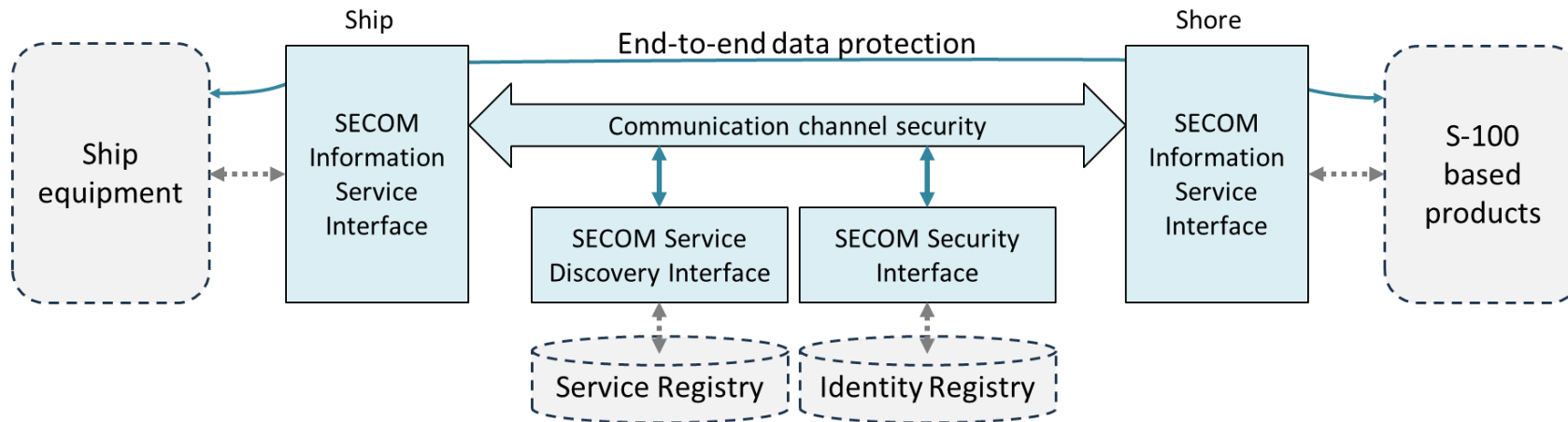
Some important S-100 specifications



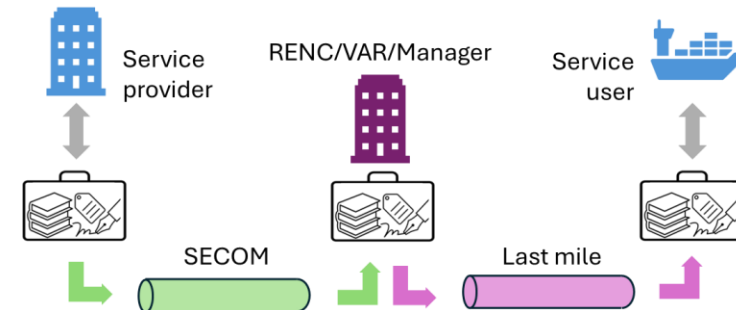
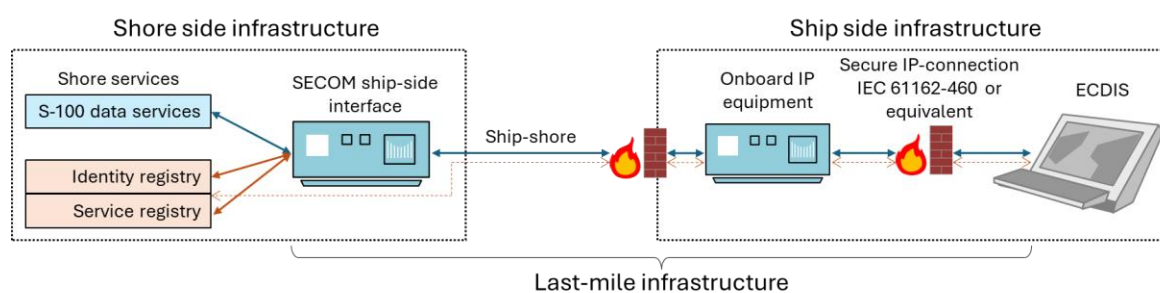
Specification
S-100 Universal Hydrographic Data Model
S-101 Electronic Navigational Chart (ENC)
S-102 Bathymetric Surface
S-104 Water Level Information for Surface Navigation
S-124 Navigational Warnings
S-127 Marine traffic management
S-131 Marine harbour infrastructure
S-421 Route exchange

Electronic Navigational Data Services (ENDS) Tree Diagram
MS – Maritime Service from e-navigation SIP

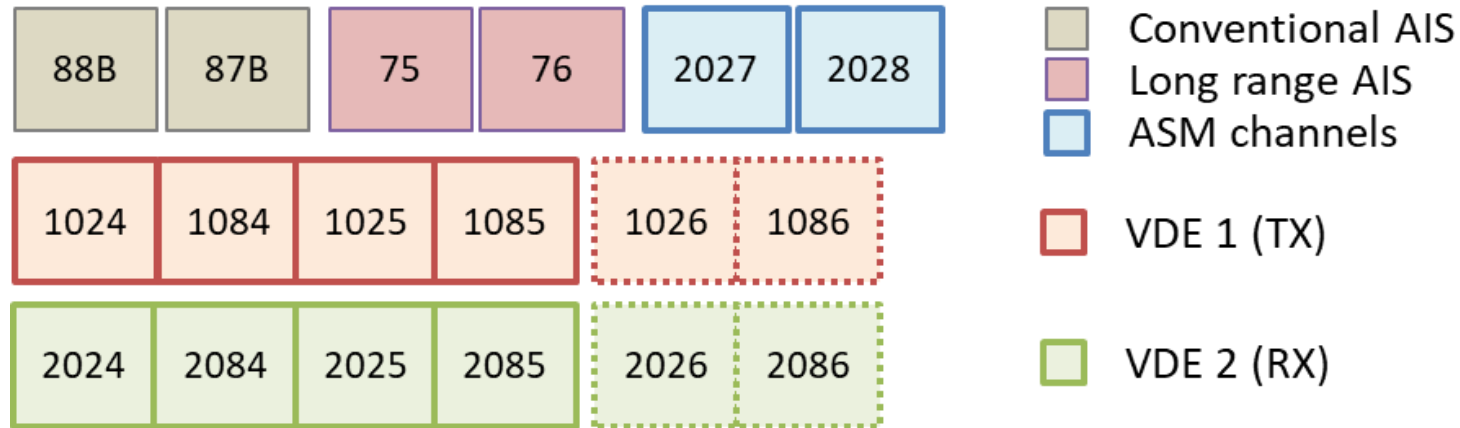
IEC 63173-2 (SECOM) and MCP



- Under development, based on STM validation project etc.
- Not finalized overall architecture?
- Lacks proper use case understanding/description?



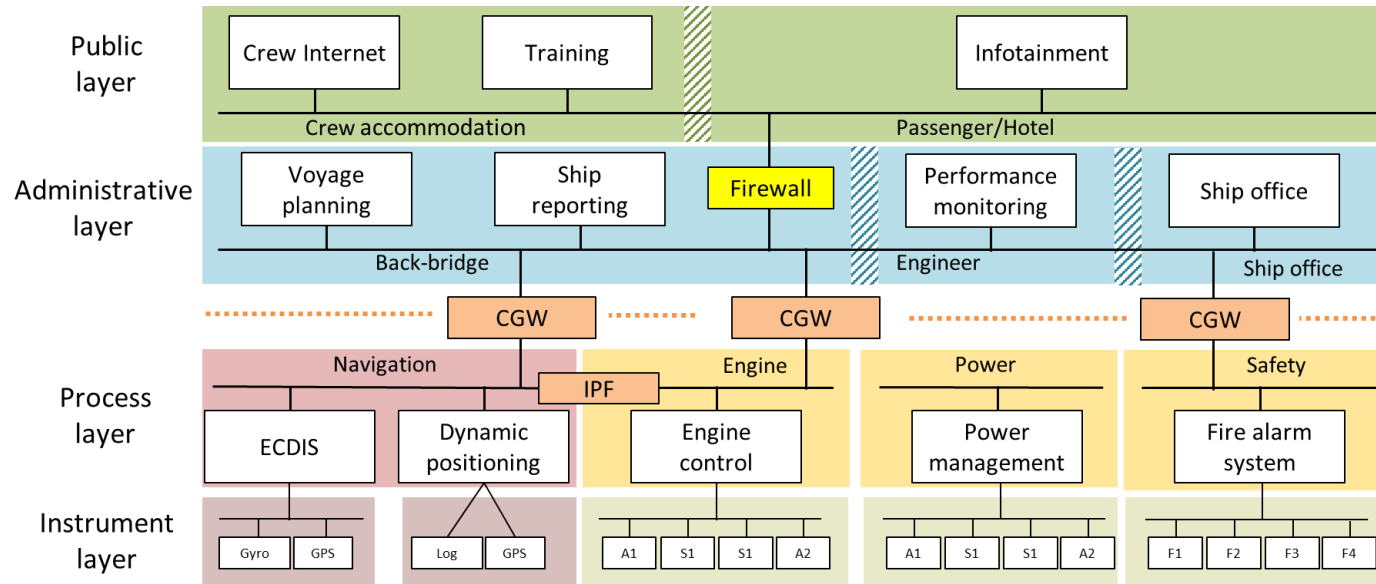
VHF Data Exchange System – VDES



- Reassignment of 25 kHz channels in VHF band from voice to digital communication
- Keep existing AIS channels, add ASM and VDE
- Approved as replacement for AIS, no carriage requirement yet

Service	Bit-rate	Byte/slot	Applications
AIS	9.6 k	32	Position and static ship data
VDES ASM	19.2 k	64	Short e-navigation messages (max ca. 170 byte)
VDES VDE	38.4 - 307 k	1024	Longer e-navigation messages (“streaming”)

Different types of networks onboard



Navigation network

- IEC 61162-1/2 (Instrument)
- IEC 61162-450/460 (Process)
- NMEA (not relevant)

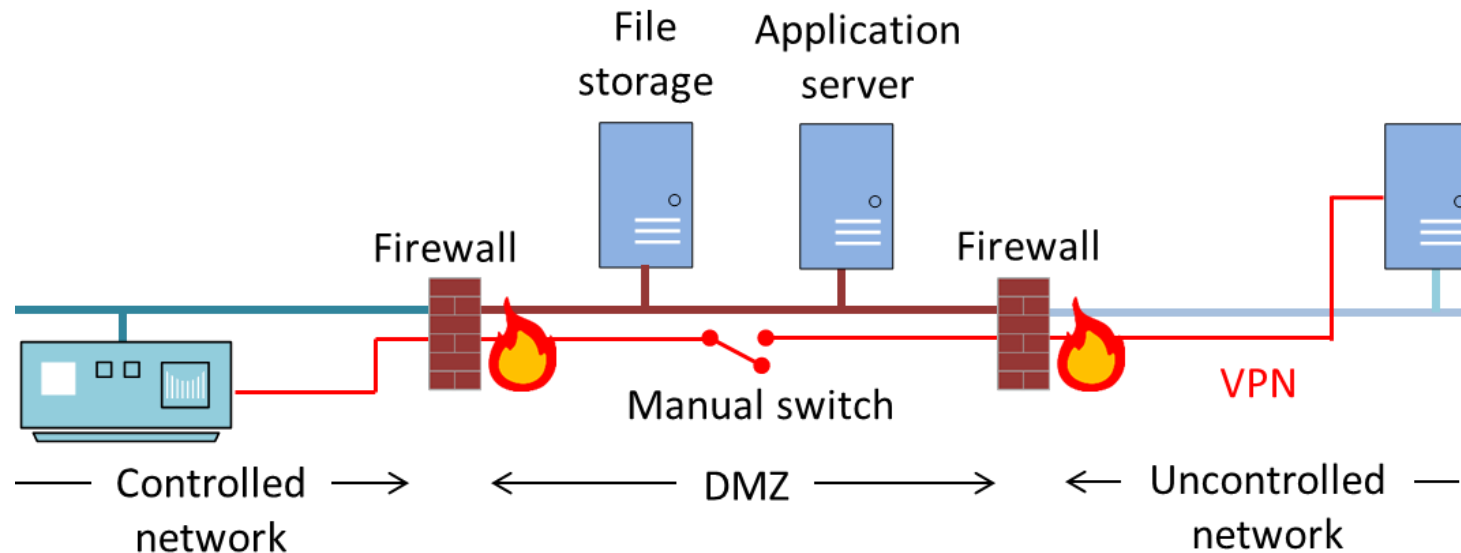
Automation/Safety network

- Fieldbus (Instrument)
- OPC UA (via application)

General data collection

- ISO 19847/48 – Tag based
- ISO 4891 (using MQTT)
- ISO/IEC 20922 (MQTT)

OT and controlled navigational networks



IEC 61162-450: Ethernet interconnection

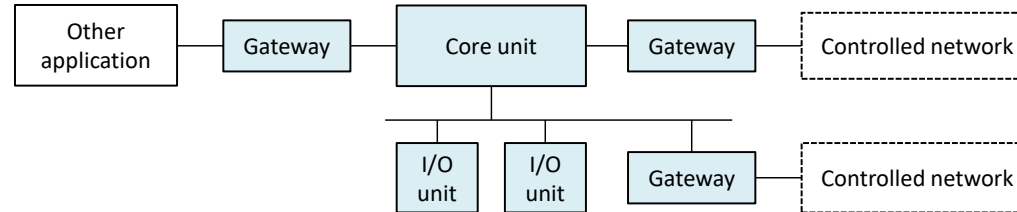
Simple UDP based replacement for IEC 61162-1 ("NMEA")

IEC 61162-460: Ethernet interconnection - Safety and security

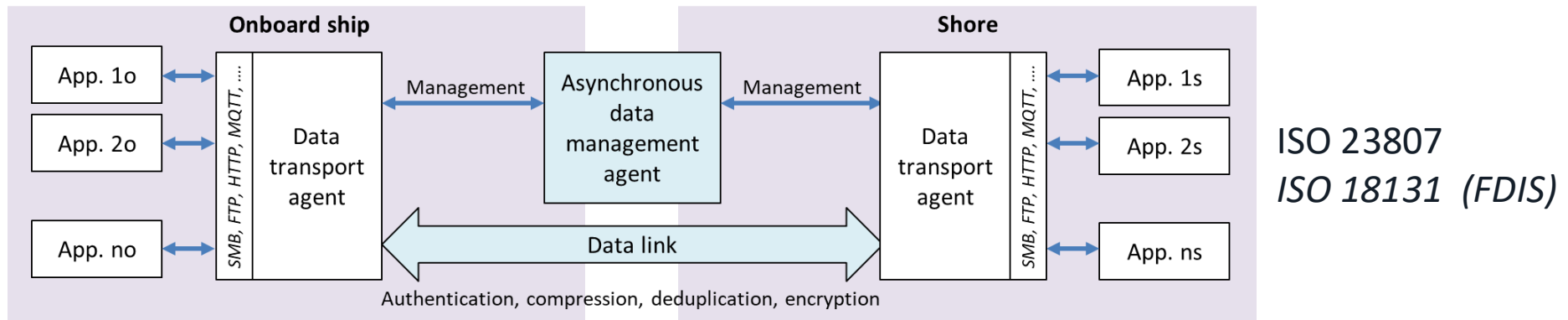
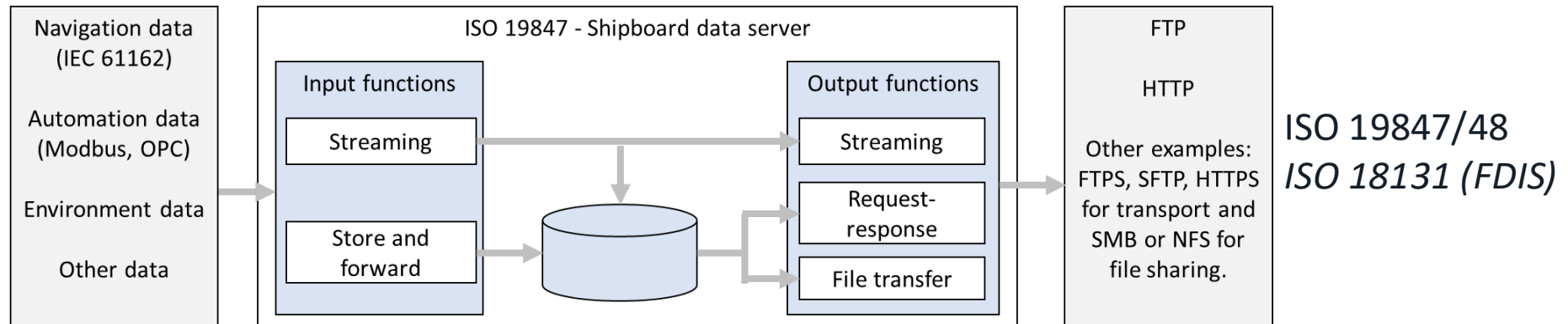
Additional security features to part 450

Compliance with IACS UR E27

Data management and collection

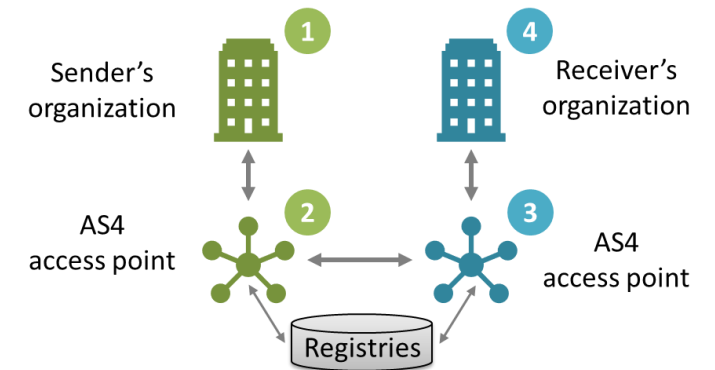
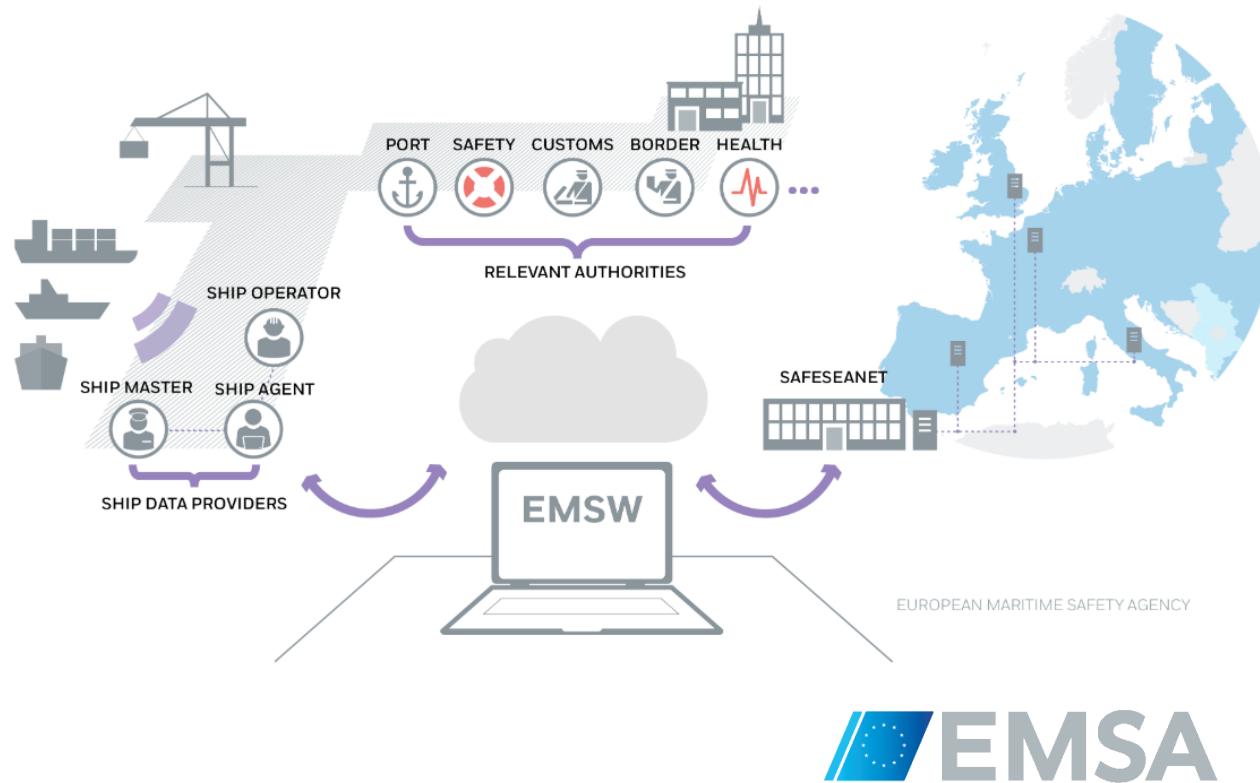


ISO 4891



Operational and administrative data exchanges

European Maritime Single Window environment



Using AS4 (ISO 15000-2)
«Four-corner model»

Same protocol as Peppol

Noon reporting

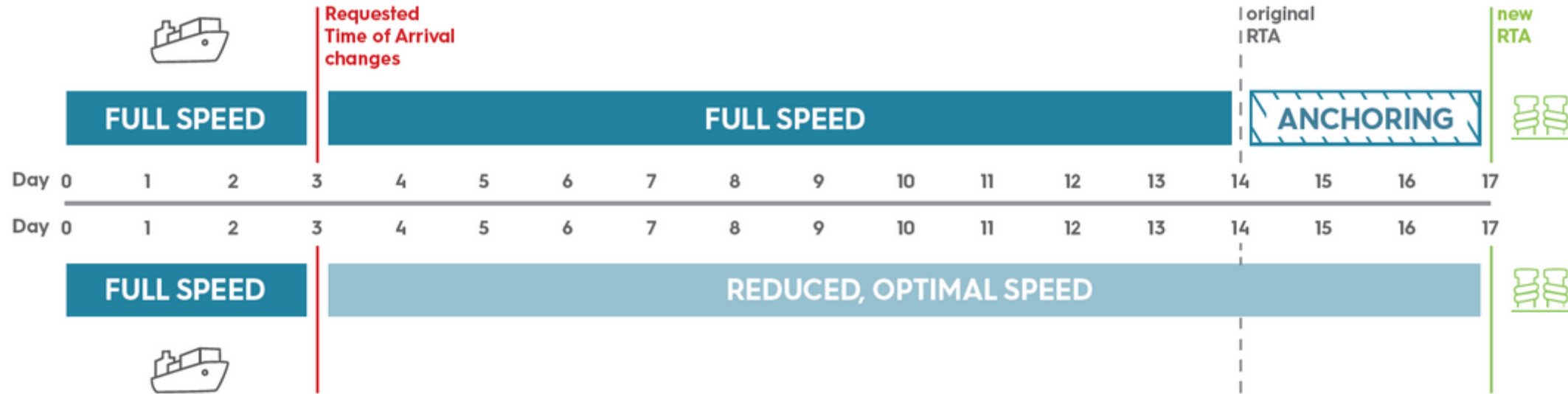


<https://smartmaritimenetwork.com/standardised-vessel-dataset-for-noon-reports/>



Now part of IMO Compendium and will be included in ISO 28005. For onboard data collection, mostly covered in ISO 19848.

Just in time port operations



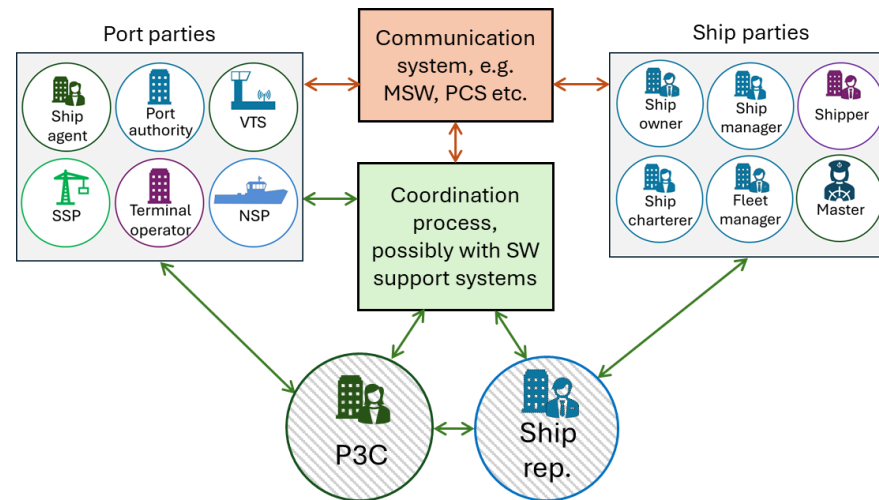
<https://greenvoyage2050.imo.org/just-in-time-arrivals/>



<https://dynaport.eu/>



<https://missionproject.eu/>



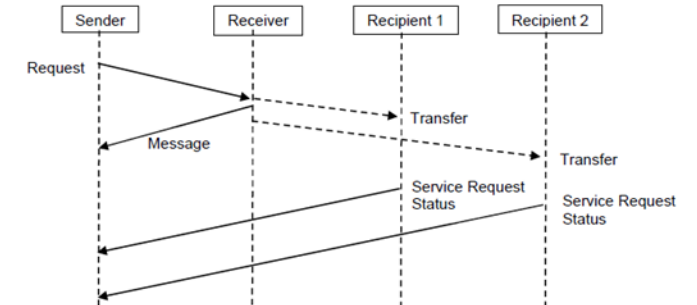
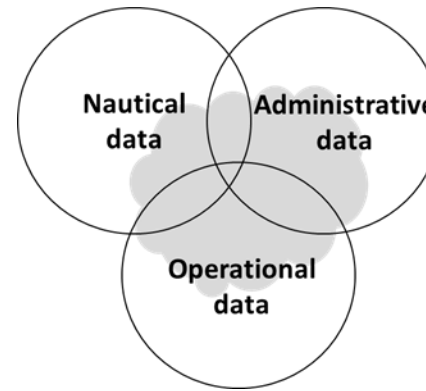
International Taskforce



Port Call Optimization

<https://portcalloptimization.org/>

ISO 28005 Operational data exchanges



ISO 28005-1 (API design principles)

ISO 28005-2,3,... (business processes and data elements)

Many different API specifications



ISO 28005 – Electronic port clearance



IEC 63173-2 SECOM



EMSWe ISO 15000-2 AS4



DCSA JSON APIs



Digital Oceans APIs



Portbase APIs

Data models

ISO 19848 – Shipboard machinery and equipment

Currently supports two different tag naming schemas

The mass of heavy fuel oil consumed by the propulsion engine

JSMA:

/jsmea_voy/Consumption/MainEngine/HeavyFuelOil///

DNV VIS:

/dnv-v2/vis-3-4a/620.1/M201.32/sec/411.1/C101/meta/qty-mass/cnt-heavy.fuel.oil

IHO Geospatial Information Registry (S-100)

IHO Geospatial Information Registry

Concept Register

[Home](#) / [GI REGISTERS](#) / [Concept Register](#)

Concept is a definition of object, information or phenomena of nature without any relation to other concept.

StatusValid

CategoryName

YearALL

port

Download

No	Name	Camelcase	Definition	Status	Date Accepted
1	Port	port	1) Person or corporation, owners of, or entrusted with or invested with ...	Valid	2025-08-18
2	Large-Volume And Heavy Goods (...)	largeVolumeAndHeavyGoodsExce...	Goods that are exceptional transports on the road due to their large vo...	Valid	2025-06-14
3	Port Support Service	portSupportService	A service that provides information necessary to organize and support ...	Valid	2025-04-29
4	Vessel Shore Reporting	vesselShoreReporting	A service providing information related to Vessel Shore Reporting and S...	Valid	2025-04-29
5	Support File Specification	supportFileSpecification	The name of the product specification to which a support file adheres.	Valid	2025-04-29
6	Support File	supportFile	Information on additional files used in addition to nautical products.	Valid	2025-04-22

<https://registry.iho.int/fc/list.do>

IMO Compendium

IMO Compendium

► Preamble of FAL.5/Circ.55 ([ES](#), [FR](#))

► History

► Read me

► Download MS Excel

► Definition, purpose and scope ([ES](#), [FR](#))

▼ IMO Data set

Introduction ([ES](#), [FR](#))

Template ([ES](#), [FR](#))

Data set overview

▼ Data sets

- General Declaration
- Cargo Declaration
- Ships Stores Declaration
- Crew's Effects Declaration
- Crew List
- Passenger List
- Dangerous Goods Manifest
- Security Report
- Adv. Notif. Waste Delivery
- Maritime Declaration Health
- Just In Time Concept
- Stowaways
- Ship and Company Certificates

IMO Compendium on Facilitation and Electronic Business

Crew List

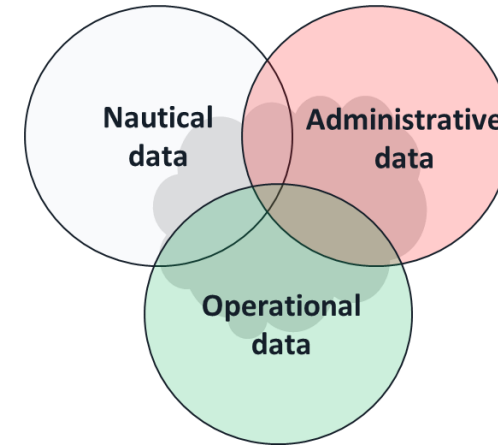
Guidance

Data elements

Chg. Ind.	Data number	Data element name	Data element definition	Format
		Message Header		
	IMO0305	Message function code	Code providing the function of a message.	an..3
	IMO0013	Arrival/departure code	A code in the message to show whether the information is submitted for the ship arrival or departure.	a1
*	IMO0014	Authentication date time	The date and time of authentication.	an..35
		Authenticator		
*	IMO0017	Authenticator party identification number	An identifying number, such as an agent identifier, of the party attesting to the validity of the transmitted information.	an..17
*	IMO0016	Authenticator family name	The family name of the person attesting to the validity of the transmitted information.	an..70
*	IMO0582	Authenticator given name	The given name of the person attesting to the validity of the transmitted information.	an..70
*	IMO0128	Authenticator role, coded	A code providing the role of the person attesting to the validity of the transmitted information.	an..3
		Voyage		
*	IMO0191	Voyage number	An operator-assigned reference code for the ship's voyage.	an..17

<https://imocompendium.imo.org/public/IMO-Compendium/Current/index.htm>

IMO Compendium bridges digital gaps

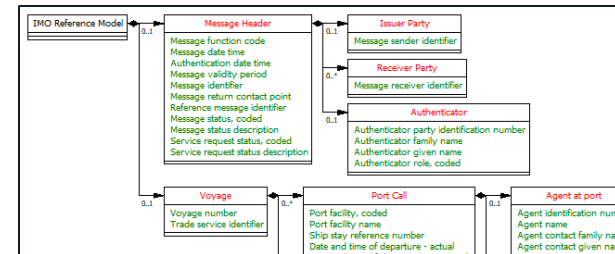
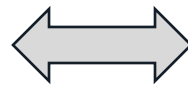


Formalized cooperation between IMO, WCO, UNECE and ISO: Established July 2019

<https://www.imo.org/en/OurWork/Facilitation/Pages/IMOCompendium.aspx>

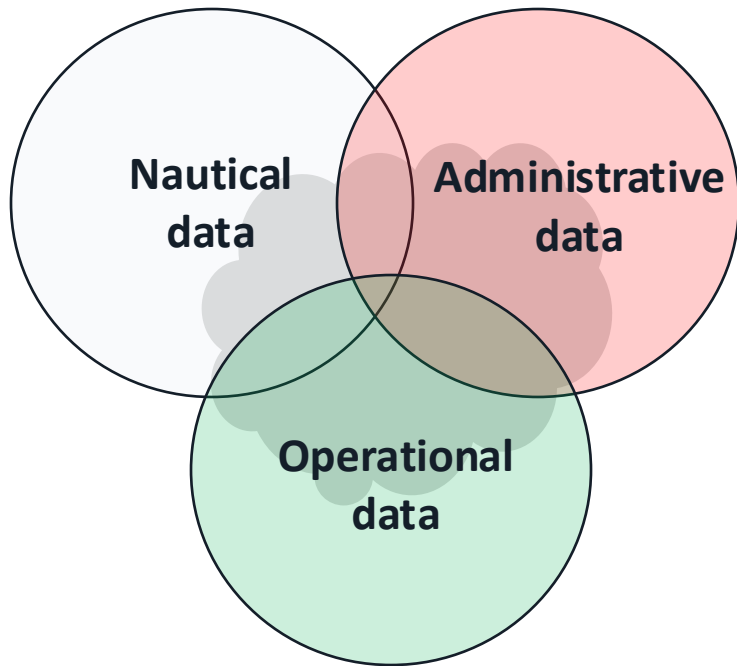


Technical specifications

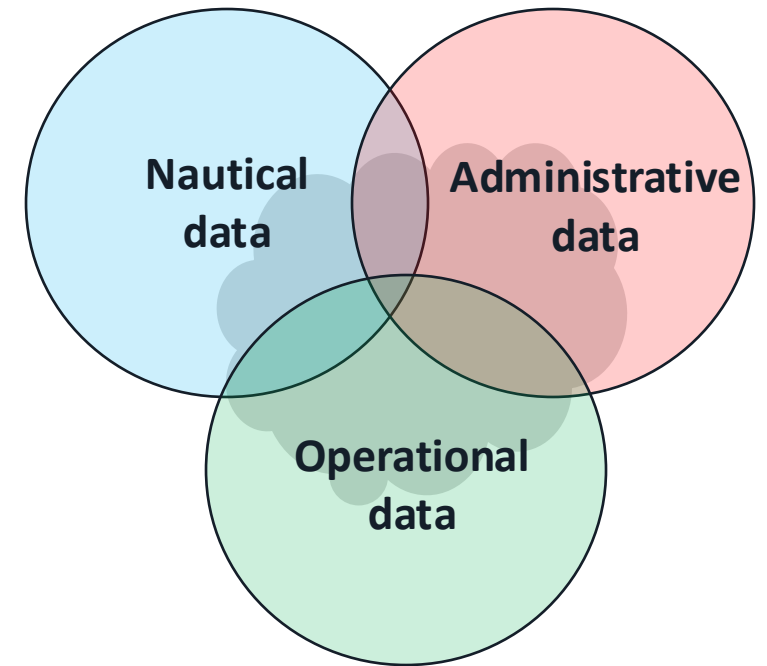


A common reference model

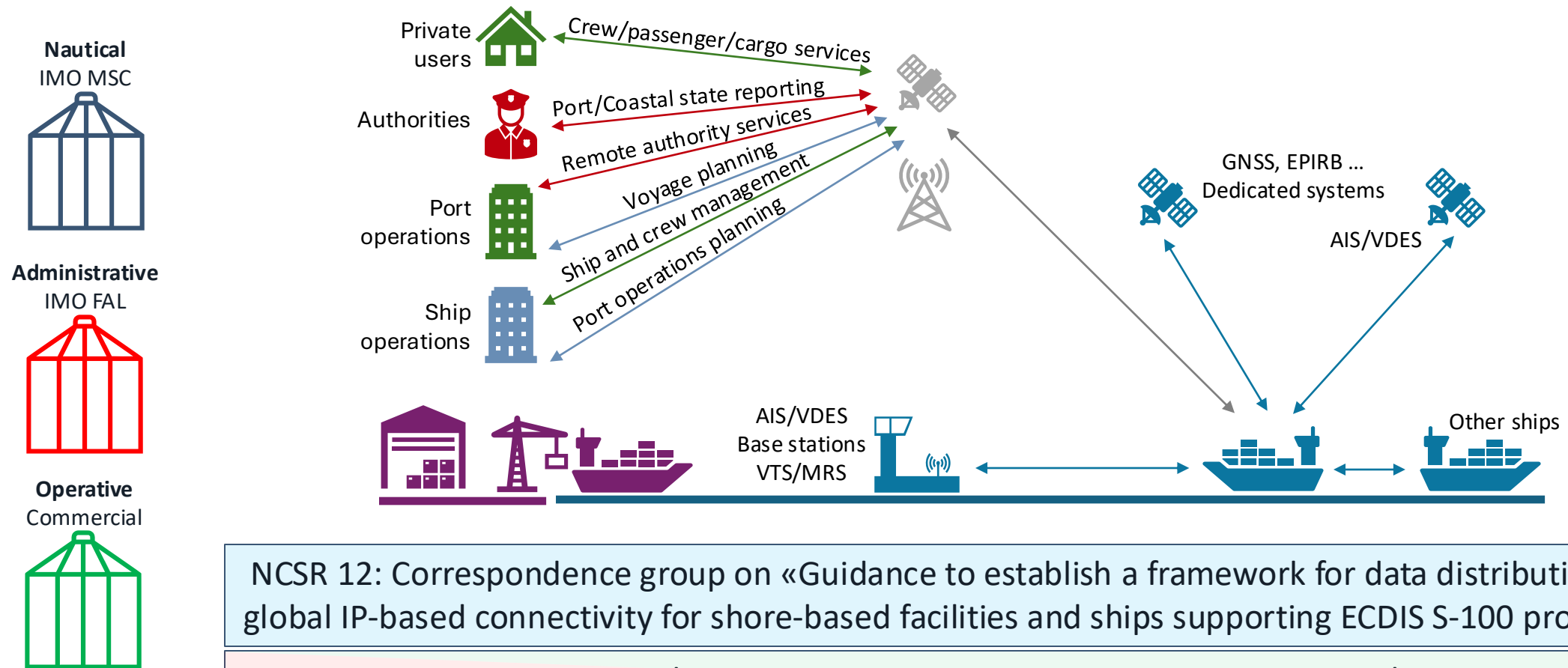
Also including relevant elements of S-100



IALA and IHO is becoming more active in IMO Compendium work!



Need more work on physical interconnections



NCSR 12: Correspondence group on «Guidance to establish a framework for data distribution and global IP-based connectivity for shore-based facilities and ships supporting ECDIS S-100 products».

FAL 49: Correspondence group on «IMO Strategy on Maritime Digitalization».

ISO new work item: «ICT reference architecture for digital ship-port interfaces».

Maritime needs ITS and ITS needs maritime!



<https://youtu.be/pbQcwQin7cU>



<https://itsnordicplus.com/event/nordic-webinar-maritime-its-next-steps/>



KYSTVERKET



ITS Norway



Fintraffic



ARUP



Join us!



Maritime
ITS



ITS
Norway



Thank you for your attention



<https://its-norway.no/en/maritime-its/>

<https://nfas.autonomous-ship.org/>



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Manager, NFAS

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