

글로벌 ICT 표준 컨퍼런스 2023

Global ICT Standards Conference 2023

ICT Standards Insights
(session2) Technical trends and issues related to IoT and Digital Twin in Korea

Maritime Connectivity Technologies

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주최



과학기술정보통신부
Ministry of Science and ICT



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Index

01 Connectivity for maritime applications

02 Features of maritime connectivity

03 Maritime Connectivity Platform (MCP): an example of connectivity technology

This research was supported by Korea Institute of Marine Science & Technology Promotion(KIMST) funded by the Ministry of Oceans and Fisheries (RS-2023-00256280)

01. Connectivity for maritime applications

Maritime vs Marine

Please **Maritime** is used most often in connection with seafaring, with sea travel, shipping, and exploration, and aspects of the sea in relation to those activities; whereas **marine** relates directly to the sea and its creatures.

Source: <https://stackexchange.com/>

Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)



ma·rine

/məˈrēn/

adjective

of, found in, or produced by the sea.
"marine plants"

Similar: saltwater seawater sea oceanic aquatic pelagic thalassic

Opposite: freshwater ^

noun

a member of a body of troops trained to serve on land or at sea, in particular a member of the US Marine Corps.
"a contingent of 2,000 marines"

Source: result from google search with "marine"

Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)



mar·i·time

/ˈmerəˌtīm/

adjective

connected with the sea, especially in relation to seafaring commercial or military activity.
"a maritime museum"

Similar: naval marine nautical seafaring seagoing sea oceangoing

• living or found in or near the sea.
"dolphins and other maritime mammals"

Similar: coastal seaside littoral

• bordering on the sea.
"two species of Diptera occur in the maritime Antarctic"

Source: result from google search with "maritime"

01. Connectivity for maritime applications

*“Connectivity refers to **all those technologies and services that allow end-users to connect to a communication network.** It encompasses **an increasing volume of data, wireless and wired protocols and standards, and combinations within a single use case or location.**”*

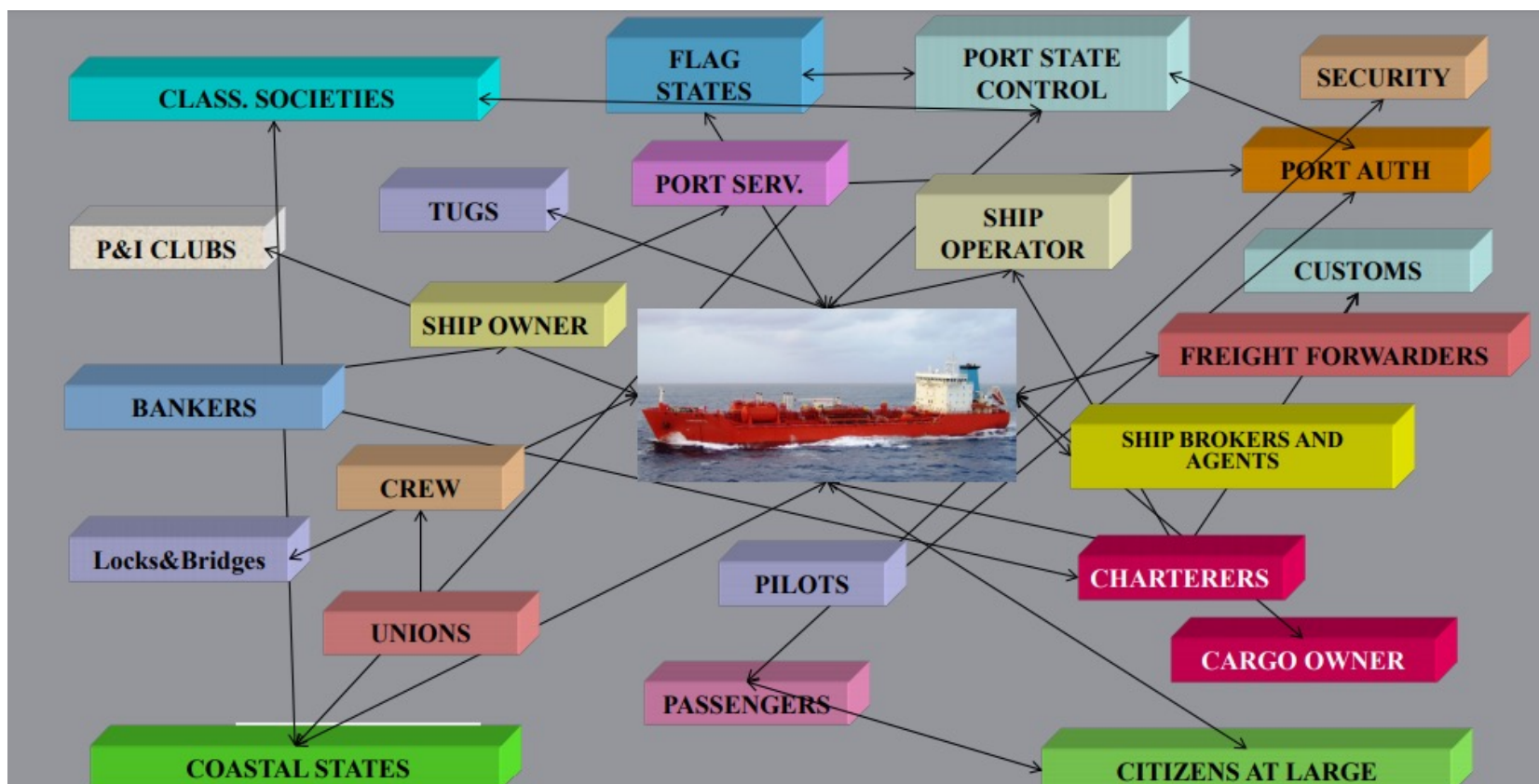
Source: <https://ati.ec.europa.eu/technologies/connectivity>

*“In general terms, connectivity is **the ability to connect systems or application programs.** Ideally, these connections are established **without requiring many changes to the applications or the systems** on which they run. Application programs may need to communicate with each other to complete transactions or to effectively balance resources at an installation.”*

Source: <https://www.ibm.com/docs/en/zvm/7.1?topic=connectivity-what-is> -

01. Connectivity for maritime applications

Stakeholders of maritime business



Source: <https://www.docksthefuture.eu/sea-traffic-management-stm-an-effective-tool-for-decarbonisation-and-safety-of-navigation/>

01. Connectivity for maritime applications

International organizations related to standards for maritime affairs



INTERNATIONAL MARITIME ORGANIZATION

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Key milestone reached on Cape Town Agreement on fishing safety

Republic of Nicaragua's accession marks major step for 2012 Cape Town Agreement entry into force and improved fishing vessel safety.

FIND OUT MORE

TOP STORY



IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the



IHO

International Hydrographic Organization

PREFERRED LANGUAGE/VOTRE LANGUE PRÉFÉRÉE: ENGLISH FRANÇAIS

ABOUT IHO | INTER-REGIONAL COORDINATION | SERVICES & STANDARDS | PUBLICATIONS | EVENTS & NEWS

DOCUMENT ARCHIVE

International Hydrographic Organization

Hydrography provided the basis for all activities which involve the sea. The International Hydrographic Organization works to ensure that all the world's seas, coasts and navigable waters are surveyed and charted, thereby supporting safety of navigation and the protection of the marine environment. It coordinates the activities of national hydrographic offices and sets standards in order to promote uniformity in nautical charts and documents. It issues survey best practices and provides guidelines to maximize the use of hydrographic information.

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SUCCESSFUL VOYAGES, SUSTAINABLE PLANET



DIGITAL@SEA INTERNATIONAL CONFERENCE

JAN 30-31, 2024 COPENHAGEN

EVENTS

SAVE THE DATE FOR DIGITAL@SEA INTERNATIONAL

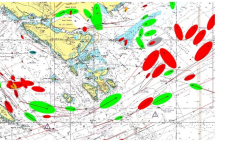
Under the title "Paving the way for a Global Maritime Digital Vision", the Danish Maritime Authority invites you to join this highly interactive event in the historical city of Copenhagen.



EVENTS

CONFERENCE FOR THE IGO

A Conference on the draft General Regulations and Financial Regulations is organized in Tokyo, Japan from 7 to 10 November 2023. National members, Signatory States and Acceding States who intend to participate are kindly requested to register here.



EVENTS

RISK MANAGEMENT TOOLS – RESIDENTIAL COURSE

The IALA WWA will run a training course on the IALA Risk Management tools from the 27th of November to the 1st of December 2023 at the DGCS Headquarters in Istanbul, Türkiye.

01. Connectivity for maritime applications

Global Maritime Distress and Safety System (GMDSS)



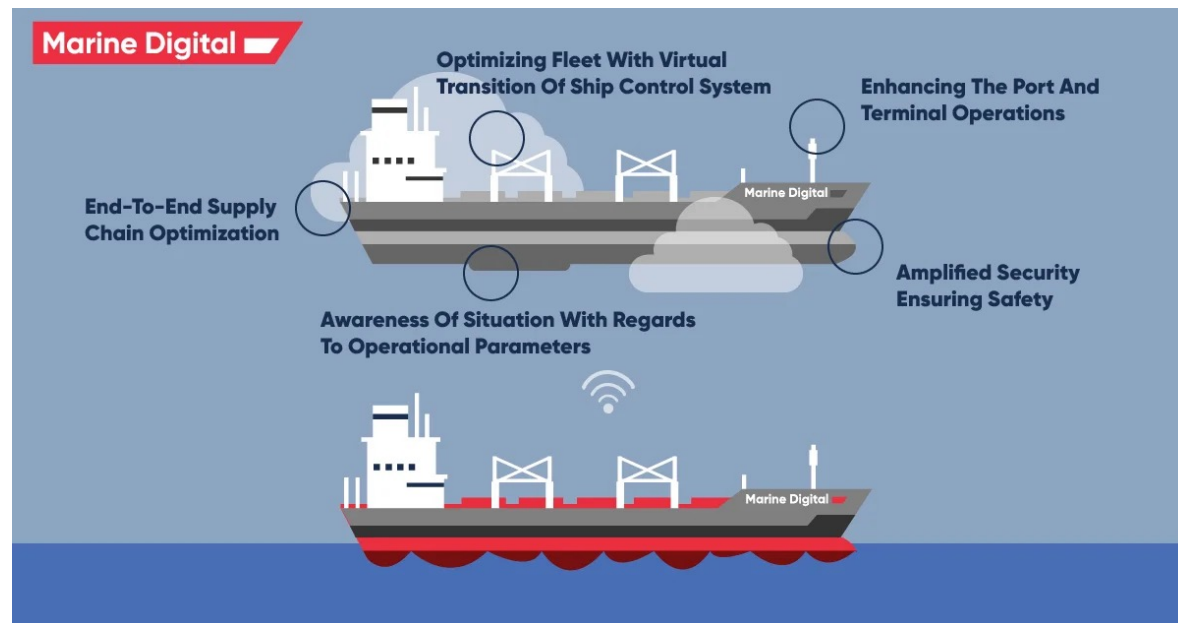
Source: Sanjin Valčić et al., GMDSS Equipment Usage: Seafarers' Experience, JMSE, 2021



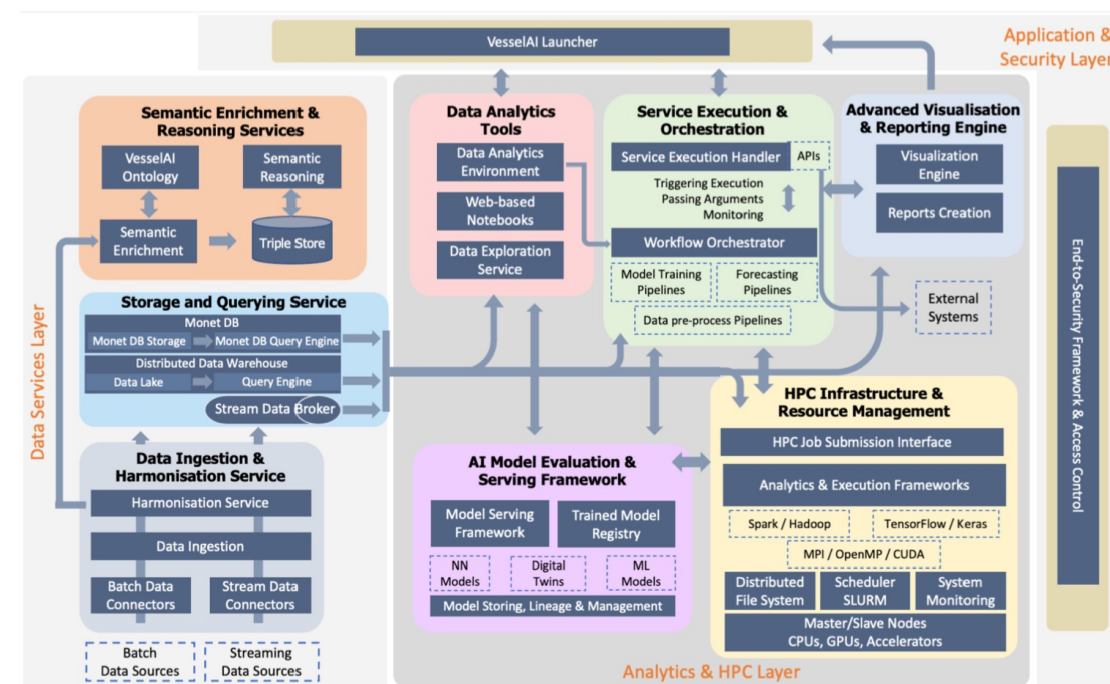
Source: https://en.wikipedia.org/wiki/Search_and_rescue

01. Connectivity for maritime applications

Ship IoT



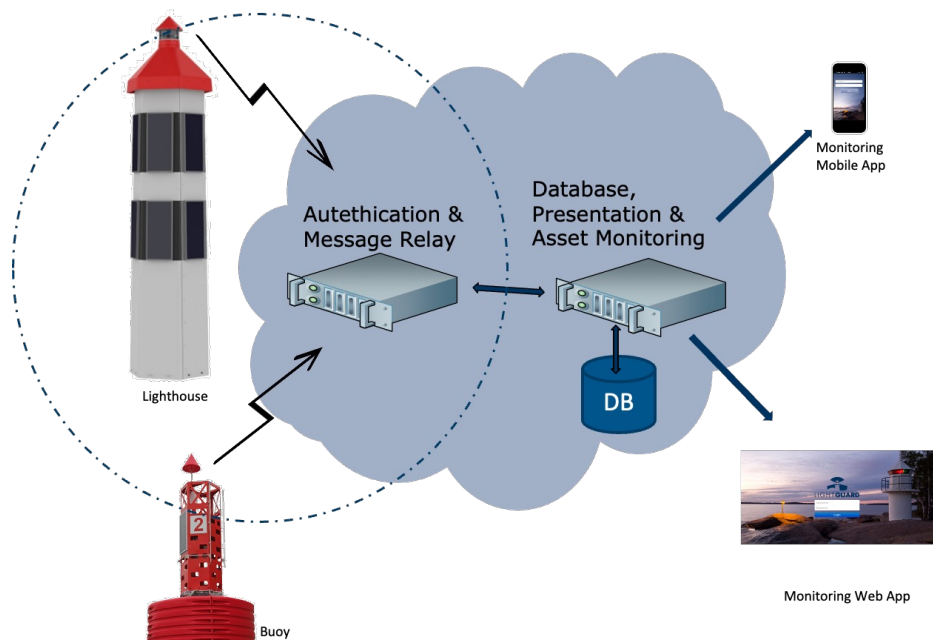
Source: https://marine-digital.com/article_5benefits_of_digital_twin



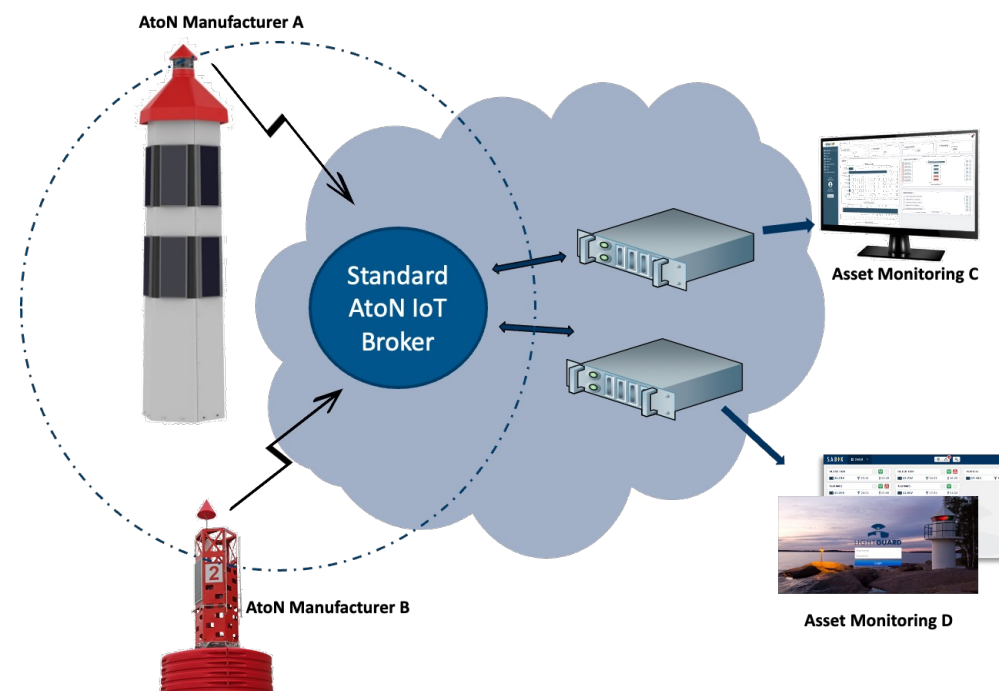
Source: ISO/IEC JTC 1/SC 41/WG 7 N-Documents, SC41WG7N091

01. Connectivity for maritime applications

AtoN monitoring



AtoN monitoring without IoT

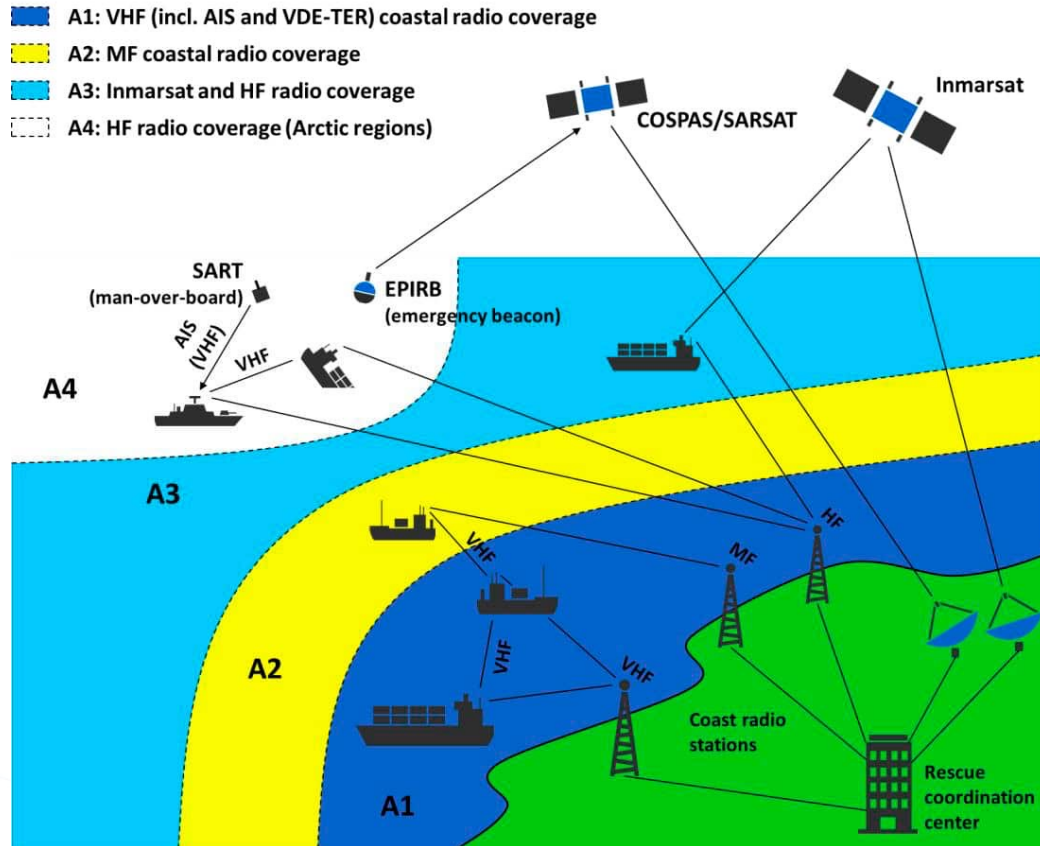


AtoN monitoring with IoT

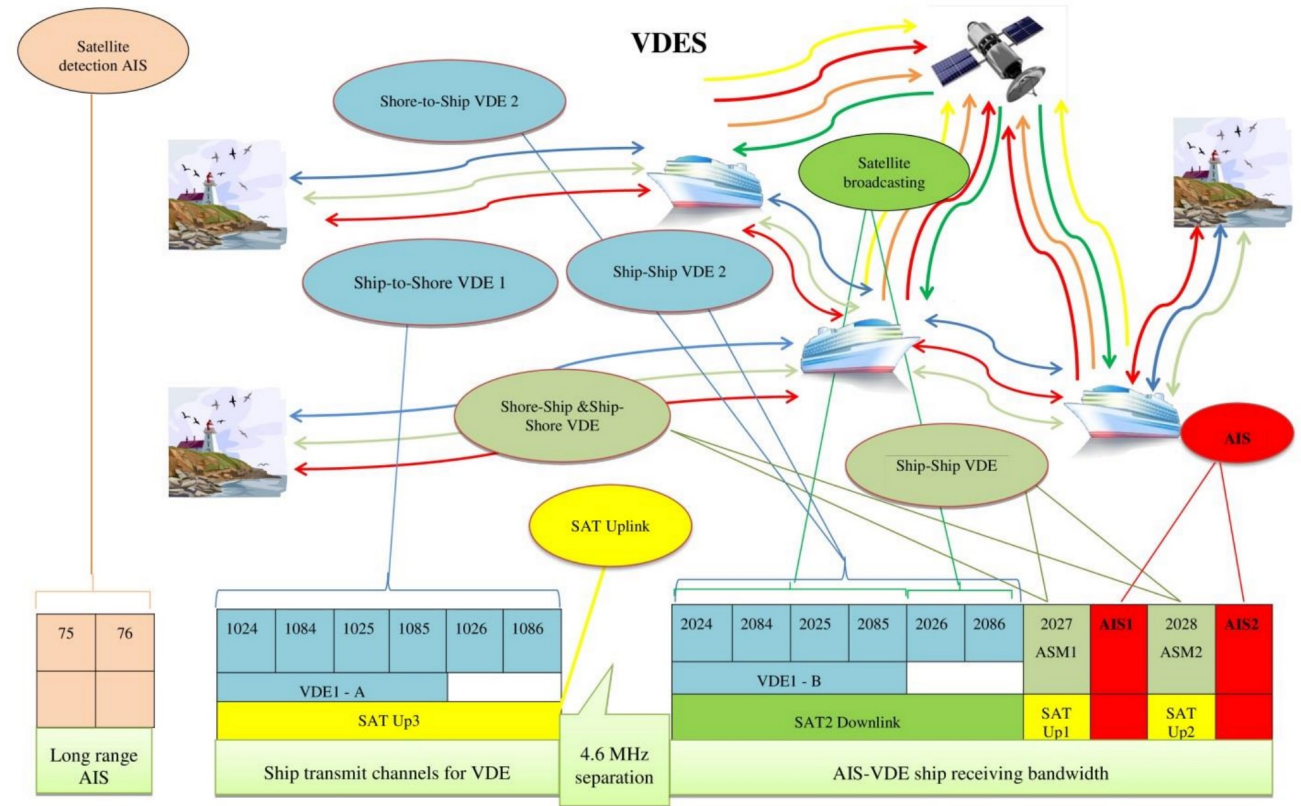
Source: Jonas Lindberg, IALA DTEC1-5.1.2.7.2 PPT Harmonized IoT for Marine Lanterns

02. Features of maritime connectivity

Maritime data communication systems (1/2)



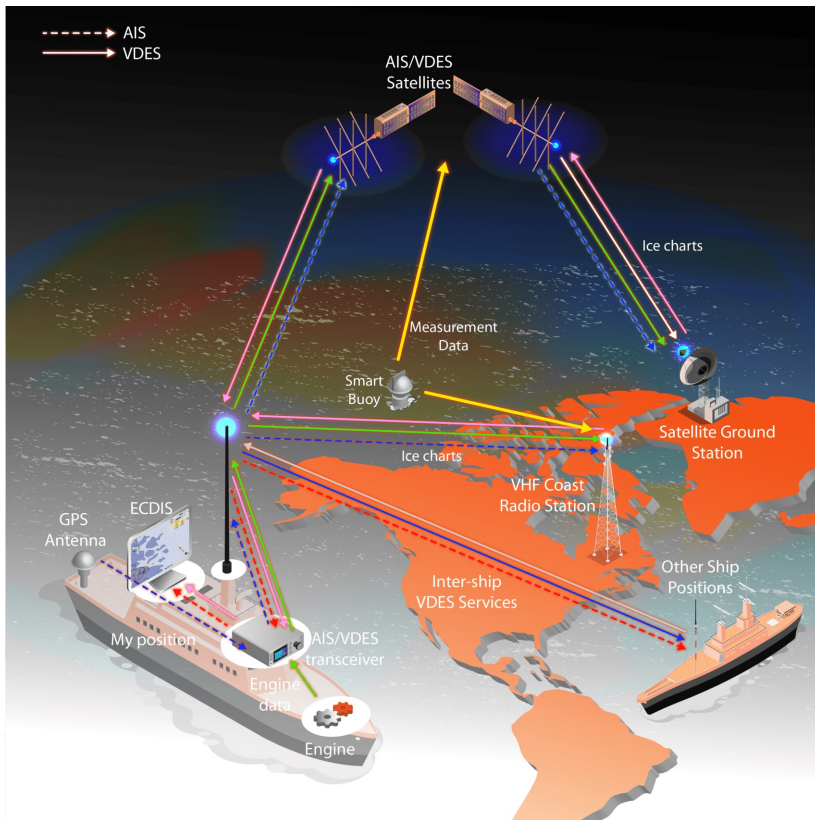
Communication systems for GMDSS
Source: <https://www.sternula.com/vdes-ais-2-0/>



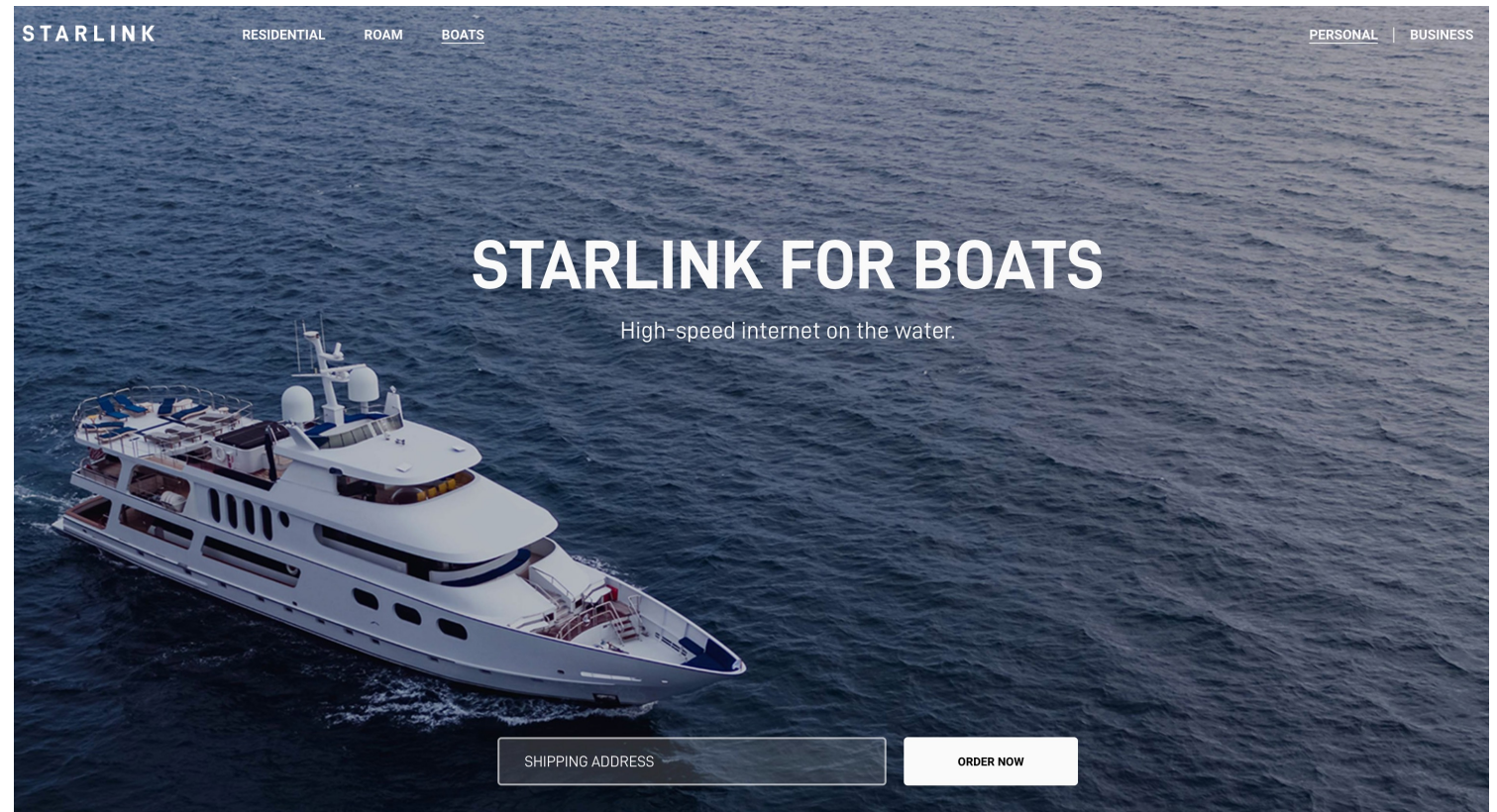
VDES Frequency allocation
Source: ITU Recommendation ITU-R M.2092-0

02. Features of maritime connectivity

Maritime data communication systems (2/2)



Source: <https://www.sternula.com/vdes-ais-2-0/>



Source: <https://www.starlink.com/boats>

02. Features of maritime connectivity

Difficulties in connectivity at sea (in terms of technology and business)

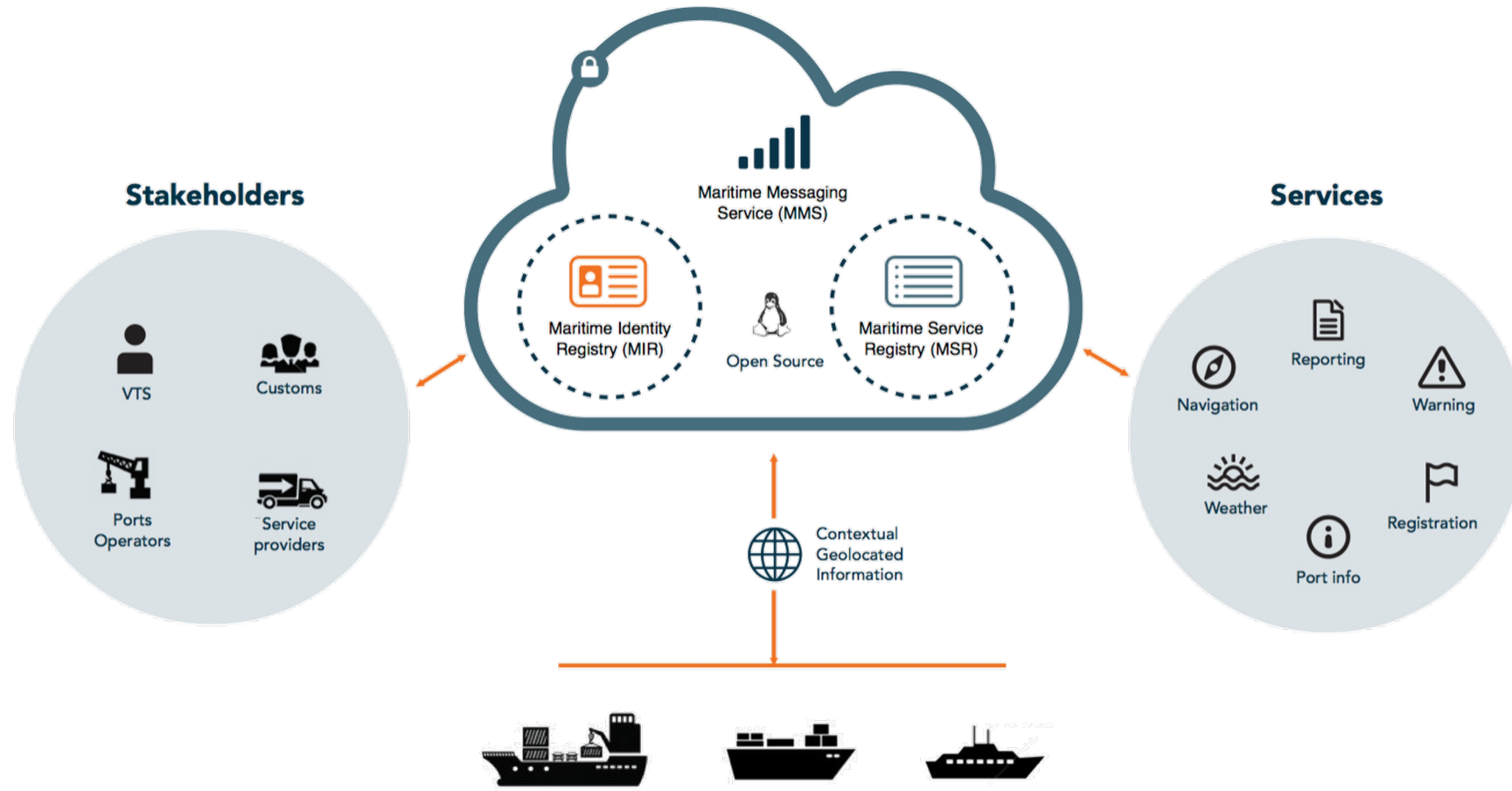
- Low bandwidth
- Less secure
- Expensive
- Use of multiple communication links between ship and ship/shore: unreliable
- Communication link changes during service subscription: handover
- Many chances of unfruitful service access in polling
- Cast-and-forget communication model: broadcast
- Reluctance to share ship's location with others: highly sensitive business asset



Source: <https://www.martek-marine.com/blog/connectivity-problems-at-sea/>

03. Maritime Connectivity Platform (MCP)

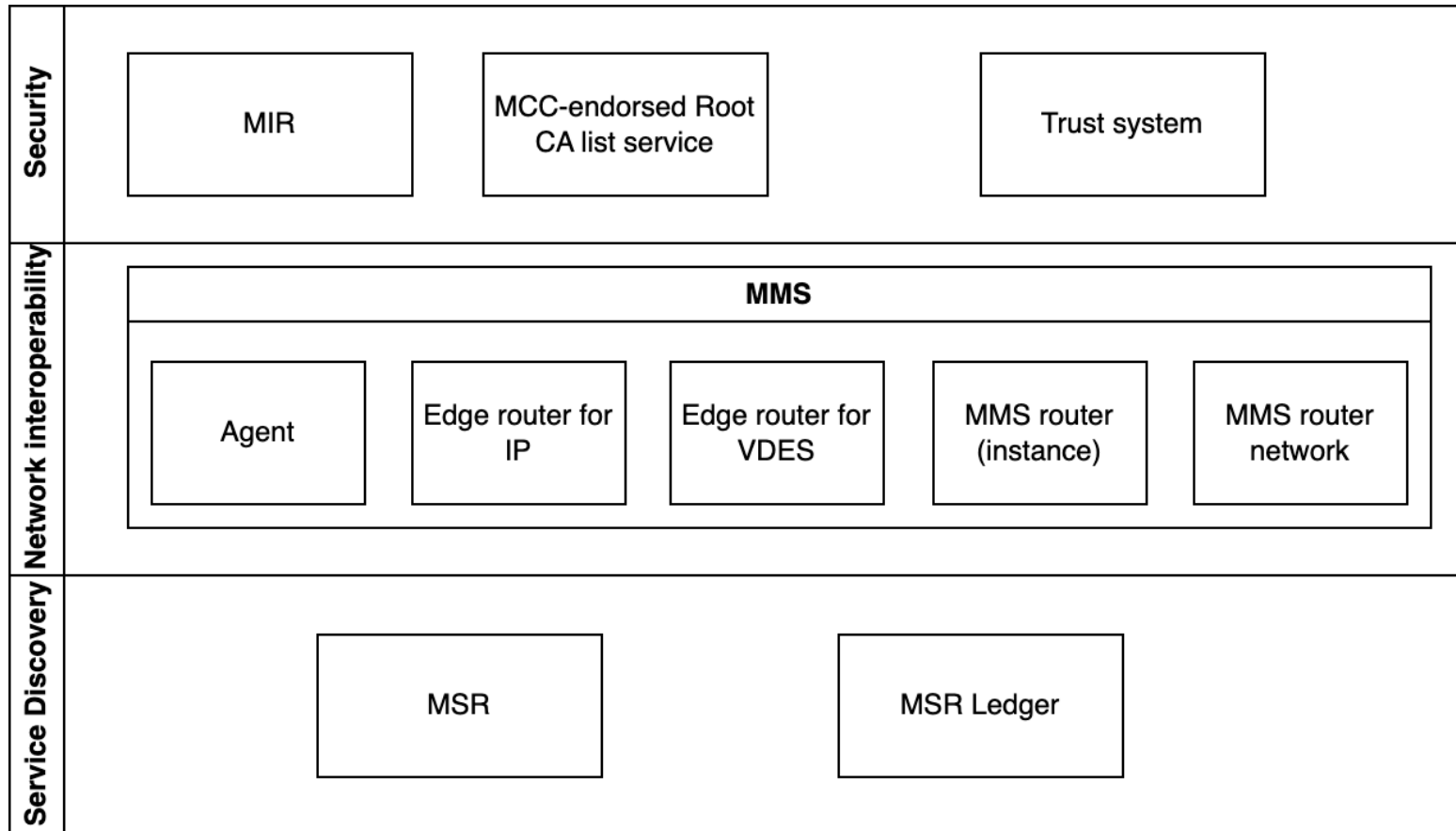
Concept



Source: <https://maritimeconnectivity.net>

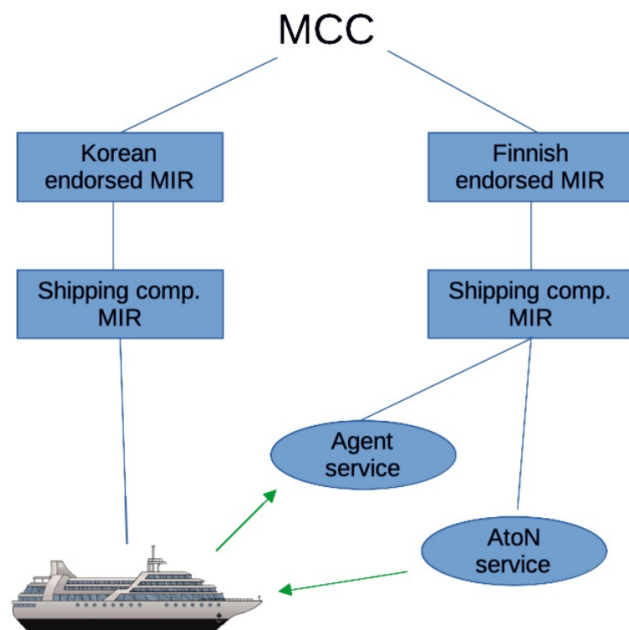
03. Maritime Connectivity Platform (MCP)

Technical components



03. Maritime Connectivity Platform (MCP)

Maritime Identity Registry (MIR)



MIR hierarchy of trust
Source: <https://maritimeconnectivity.net>

MCP Gen4 Requirements for MCP identity service providers

MCP IDsec1 MCC Identity Management and Security; General Approach and Basic Requirements

MCP IDsec2 MCC Identity Management and Security; Identity Management

MCP IDsec3 MCC Identity Management and Security; Public Key Infrastructure (PKI)

MCP IDsec4 MCC Identity Management and Security; Authentication and Authorization for Web Services

MCP Gen5 Vetting Procedure for MCP Instance Providers

MCP Gen7 Procedure for endorsing MCP identity service providers

List of MIR documents
Source: <https://maritimeconnectivity.net>

03. Maritime Connectivity Platform (MCP)

Maritime Service Registry (MSR)

SPECIFICATIONS

Search filters

Keywords

Search

Registered by

All

Endorsed by

No filter

Register new Specification

Name	Version	Status	Organization	Description
PTBS(Pilotage and Tugs Business Support) service	0.1	provisional	SMART-Navigation Project Offic...	provide Pilotage and Tugs business information to shore and marine user
Safety navigation support service for pilotage and...	0.1	provisional	SMART-Navigation Project Offic...	Providing information necessary for safe pilot and tug work
PortCDM Assisted Message Submission Service	0.5	provisional	RISE Viktoria	The service facilitates submitting port call messages in the cases where the data provider does not know the specific port call identifier to which the message belongs. The service, an optional part of PortCDM, assists in deducing the port call ident...
AVS	0.1	provisional	SMART-Navigation Project Offic...	Accidents Vulnerability vessel monitoring support System
DMI Ice Chart Baltic service	0.1	released	Danish Meteorological Institut...	Baltic Ice chart according to S-411 format, produced by Finish Meteorological Institute (FMI) and converted to S411 by Federal Maritime and Hydrographic Agency (BSH)
PortCDM Message Broker Service	0.5.1	provisional	RISE Viktoria	The service facilitates message brokering between data producers and data consumers, as part of the PortCDM interaction pattern.
vessel history data query by region	1.1.1	provisional	Maritime Safety Administration...	Query history data of the vessel according to region, start time and end time
vessel real-time data query by region	1.1.1	provisional	Maritime Safety Administration...	Query real-time data of the vessel according to region
DMI Ice Chart Greenland service	0.1	released	Danish Meteorological Institut...	Greenland Ice Chart according to S-411 format, produced by Danish Meteorological Institute (DMI)

MARITIME SAFETY INFORMATION SERVICE

MRN

urn:mrn:mcl:service:instance:smart:sv52-msi

Name

Maritime Safety Information Service

Version

0.2

Status

provisional

Organization

SMART-Navigation Project Office

Description

Provide Maritime Safety Information to consumer

Service endpoint

Compliant

Yes

Implemented design

Maritime Safety Information Service - 0.2

Download document

Download XML

Update Instance

Delete Instance

Endorse Instance

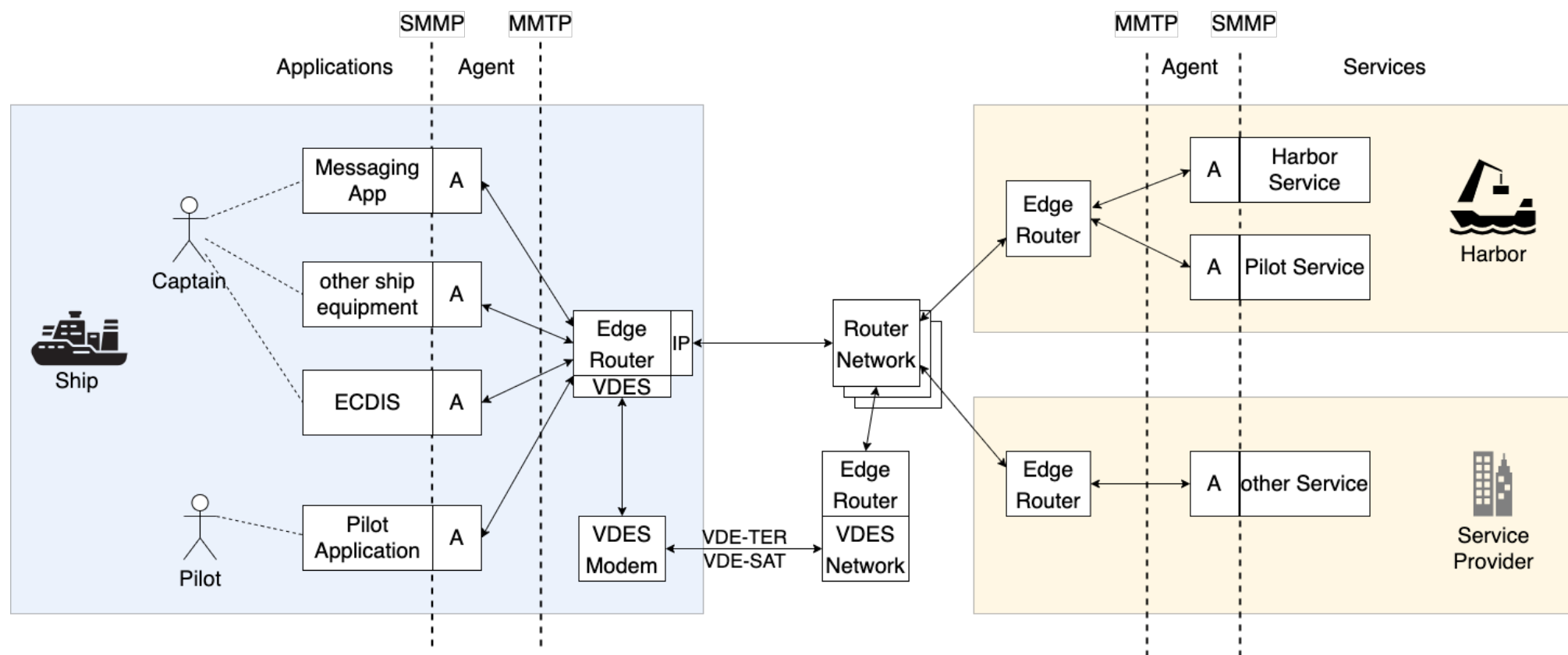
COVERAGE AREA OF MARITIME SAFETY INFORMATION SERVICE

Maximize Map

Source: <https://maritimeconnectivity.net>

03. Maritime Connectivity Platform (MCP)

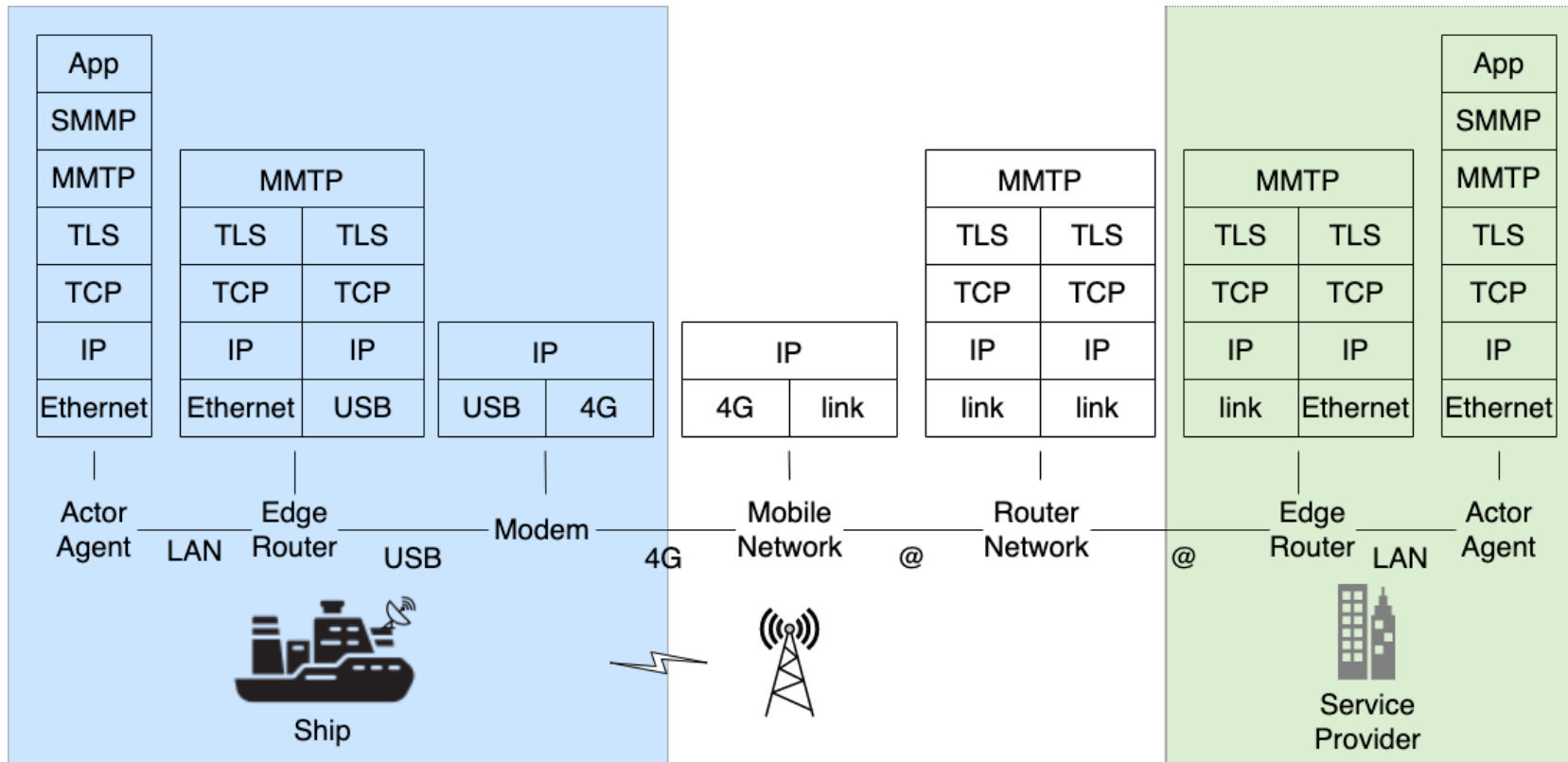
Maritime Messaging Service (MMS): overall configuration



Source: <https://maritimeconnectivity.net>

03. Maritime Connectivity Platform (MCP)

Maritime Messaging Service (MMS): protocol stack



Source: <https://maritimeconnectivity.net>

03. Maritime Connectivity Platform (MCP)

MCP Consortium


Maritime Connectivity Platform

[Consortium](#)
[MCP Documents](#)
[Testbed & Reference Implementation](#)
[MCP Service Providers](#)

Consortium

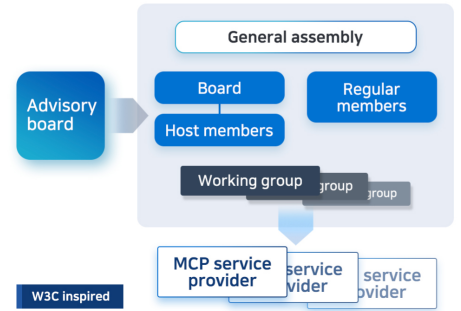
The MCP consortium (MCC) is governing body of the MCP. It defined the criteria of being MCP service providers and endorses organisations to be such.

Structure

The Structure of MCC

The MCC has been structured in a way inspired by the World Wide Web consortium (W3C). An as with W3C, the MCC has a few number of host members, which are all non-profit organisations. An addition to these, there are regular members, which can also be for-profit-organisations. The host members form the board, which decides on new members and endorses MCP service providers. Documents defining the criteria for being MCP services providers must be adopted by the General Assembly, in which all members are represented, with veto possibility for the host members. Furthermore, the MCC has an advisory board and a few governmental observers that are represented at the board, but without voting rights.

Maritime Connectivity platform Consortium



Source: <https://maritimeconnectivity.net>



Thank you

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