INTERNATIONAL MARITIME ORGANIZATION

E

MSC.1/Circ.1610/Rev.1
24 June 2024

DESCRIPTIONS OF MARITIME SERVICES IN THE CONTEXT OF E-NAVIGATION

1   The Maritime Safety Committee, at its 101st session (5 to 14 June 2019), adopted resolution MSC.467(101) on *Guidance on the definition and harmonization of the format and structure of Maritime Services in the context of e-navigation*, and:

    .1   agreed to consolidate the descriptions of Maritime Services and to consider them together with all involved international organizations and interested Member States in order to harmonize the provision and exchange of maritime information and data; and

    .2   invited Member States and international organizations acting as domain coordinating bodies to submit descriptions of Maritime Services to the Organization, taking into account the guidance provided in the resolution.

2   In doing so, the Committee also approved MSC.1/Circ.1610 containing initial descriptions of Maritime Services in the context of e-navigation, which would be periodically updated, taking into account developments and related work on harmonization.

3   Since the approval of MSC.1/Circ.1610, the initial descriptions of Maritime Services have been widely utilized, tested or further developed based on experiences gained.

4   As a result, the Facilitation Committee, at its forty-sixth and forty-seventh sessions, approved revised descriptions of Maritime Services within its remit. The Sub-Committee on Navigation, Communications and Search and Rescue, at its tenth session, also reviewed and updated the descriptions of Maritime Services within its remit and prepared a revision of MSC.1/Circ.1610.

5   The Maritime Safety Committee, at its 108th session (15 to 24 May 2024), approved the present revised circular containing the updated descriptions of Maritime Services in the context of e-navigation, as set out in the annex, consolidating the work of the Facilitation Committee and the Sub-Committee on Navigation, Communications and Search and Rescue based on information submitted by Member States and international organizations acting as domain coordinating bodies.

6   The information contained in the annex provides updated Maritime Service descriptions and is a contribution towards the harmonization of the format and structure of Maritime Services. These descriptions are expected to continue to be periodically updated, taking into account developments and related work on harmonization.

7   Interested Member States, international organizations and other stakeholders are invited to contribute to the work on harmonization of the format and structure of Maritime Services, either through the Organization or through the relevant domain coordinating bodies.

NAVIGATING THE FUTURE: SAFETY FIRST!

8   Member States and international organizations are invited to bring the information contained in this document to the attention of those responsible for the development or implementation of Maritime Services.

9   This circular supersedes MSC.1/Circ.1610.

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ANNEX[1]

DESCRIPTIONS OF MARITIME SERVICES IN THE CONTEXT OF E-NAVIGATION

INDEX

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[1]   The information contained in this annex is provided in English only.

MS 1 – Vessel traffic service

1.1   Submitting organization

IALA

1.2   Coordinating bodies

IMO and IALA

1.3   Description of the Maritime Service

This Maritime Service in the context of e-navigation is a digital information service for the exchange of vessel traffic services (VTS) information by electronic means between a VTS and ships in the VTS area and shore-based users. The Maritime Service in the context of e-navigation means the exchange of VTS information by electronic means, which should not be confused with operational services for a VTS independent of the way of service provision.

1.3.1   Operational description

VTS means a service implemented by a Government with the capability to interact with vessel traffic and respond to developing situations within a vessel traffic service area to improve the safety and efficiency of navigation, contribute to safety of life at sea and support the protection of the environment.

Resolution A.1158(32) on *Guidelines for Vessel Traffic Services* provides that:

> "3.1   The purpose of VTS is to contribute to the safety of life at sea, improve the safety and efficiency of navigation and support the protection of the environment within a VTS area by mitigating the development of unsafe situations through:
>
> .1   providing timely and relevant information on factors that may influence ship movements and assist onboard decision-making.
>
> .2   monitoring and managing ship traffic to ensure the safety and efficiency of ship movements.
>
> .3   responding to developing unsafe situations."

IALA Guideline G1089 on *Provision of a VTS* provides guidance for the provision of VTS to participating ships in a harmonized manner in accordance with internationally approved guidelines and IALA standards.

1.4   Purpose

The purpose of this digital Maritime Service is to support the provision of VTS to participating ships by providing information in a digital format.

Information could be presented in appropriate systems on board and ashore in order to create the means to reduce the administrative burden and information overload, reduce miscommunication due to external interference, simplify work procedures, promote sustainable shipping and increase navigational safety.

This Maritime Service could be used for digital information exchange between a VTS and other stakeholders, such as conventional ships, maritime autonomous surface ships (MASS) and allied services.

1.5   Operational approach

The digital information provided in this Maritime Service could be delivered by several different means, such as automatic identification system (AIS) or VHF Data Exchange System (VDES) messages, by IP-based communication and using S-100 based product specifications and other international standards.

Information provided digitally could partly replace voice communications in non-time-critical situations and, in addition, complement voice communications in time-critical situations.

The steps to achieve this transition to digital information exchange may vary in different areas and for different types of vessels. Details about digital information exchange should be published by the VTS provider.

IALA publishes standards and associated recommendations and guidelines specifically related to technical services and specifications used for the implementation of this Maritime Service.

1.6   User needs

The use cases are generic and intended for description purposes only.

1.6.1   Use case – Providing timely and relevant information

The provision of timely and relevant information on factors that may influence the ship's movements and assist onboard decision-making should be provided where:

- deemed necessary by the VTS; or

- requested by the participating ship.

Vessels could receive timely and relevant information in a digital format that can be displayed in the navigational equipment on board. This may include but is not limited to:

- navigational situations (including traffic and route information);

- navigational warnings;

- meteorology;

- meteorological warnings;

- hydrography;

- electronic navigational aids; and

- other information.

1.6.2   Use case – Managing ship traffic

Vessels could receive information related to the management of ship traffic in a digital format that could be displayed in the navigational equipment on board. Digital information exchange may apply to elements of the management of ship traffic that are not time-critical.

This information may include but is not limited to the following examples:

- Slot management: provides vessels digitally with priority of arrival and distance between two vessels.

- Traffic clearance: provides vessels digitally with permission to proceed, impose conditions or deny entry.

- Anchorage: assigning anchorage positions in digital format.

- Route information: VTS and vessels digitally exchange planned and recommended routes.

- Waterway management: VTS and vessels digitally exchange intentions and recommendations related to traffic situations, such as overtaking of another vessel.

- Information regarding restricted or no-go areas: the content (draft, closed fairway/port/quay, etc.) could be provided digitally to vessels without using voice communication.

1.6.3   Use case – Responding to unsafe situations

VTS responding to developing unsafe situations could be supported by the provision of navigational information in digital format. Information provided digitally could complement voice communications in time-critical situations and in addition, partly replace voice communications in non-time-critical situations.

This information may include but is not limited to the following examples:

- A vessel deviating from the route: an updated route could be sent digitally to a vessel.

- The content of voice communication could be provided digitally and be displayed as text in parallel/in addition to voice communication.

- Risk of grounding/striking/collision. In addition to voice communications, the vessel could be provided with an electronic route recommendation or waypoint.

1.7   Information to be provided

Technical services and data models used for the implementation of this Maritime Service are under development. *S-212 VTS Digital Information* (under development) is a product specification for encoding VTS Information. It is based on the IHO S-100 framework specification and the ISO 19100 series of standards.

Information elements provided in the Maritime Service may include but are not limited to:

- Meteorological data, using AIS/VDES Application-Specific Messages defined in SN.1/Circ.289 or S-100 based product specifications being developed by the WMO Commission for Weather, Climate, Water and Related Environmental Services and Applications (WMO Services Commission) (S-411 to S-414).

- Navigational warning information, using *S-124 Product Specification for Navigational Warnings.*

- Information related to aids to navigation (AtoN), using virtual AtoN following the guidance from IALA Guideline *G1081 Provision of Virtual Aids to Navigation* or *S-125 Product Specification for Marine Navigational Services.*

- Route information, using AIS/VDES Application-Specific Messages defined in *SN.1/Circ.289, IEC S-421 Product Specification on Route Plan 63173-1:2021* or *IEC specification 61174-1:2021 Route plan exchange format.*

- Restricted area information, using AIS/VDES Application-Specific Messages defined in *SN.1/Circ.289*.

- VTS and SRS Area and Reporting information, using *S-127 Product Specification on Marine Traffic Management.*

1.8   Associated technical services

The table below lists potential technical services associated with this Maritime Service. The list may be updated.

Name	ID (MRN)	Description	Standardization body
Voyage information service	urn: mrn: iala: techsvc[1]	The service supports the exchange of voyage plans, text messages and area messages.	IALA
Meteorology service	urn: mrn: wmo[1]	The service supports the provision of information which could include the speed and direction of the prevailing wind, direction and height of the waves, visibility, atmospheric pressure, the formation of ice, etc.	WMO
Meteorological warnings service	urn: mrn: wmo[1]	The service supports the provision of warnings concerning gale, storm, tsunami, restricted visibility, etc.	WMO
Hydrographic service	urn: mrn: iho[1]	The service supports the provision of information which could include factors such as the stability of the seabed, sea depth, the accuracy of surveys, tidal ranges, tidal streams, prevailing currents and swell, etc.	IHO
AtoN information service to end users	urn: mrn: iala: techsvc[1]	The service supports the provision of aids to navigation information for end-users (primarily navigators).	IHO, IALA
Service for provision of navigational warnings to end-users	urn: mrn : iho[1]	The service supports the provision of safety-related messages such as dangerous wrecks, obstacles not otherwise promulgated, diving operations, vessels not under command, etc.	IHO

Name	ID (MRN)	Description	Standardization body
Route information service	urn: mrn: iala: techsvc[1]	The service provides route recommendations and/or route validation for ships.	IALA
Slot management service	urn: mrn: iala: techsvc[1]	The service allocates ships in a time window to ensure safe voyages in the VTS area.	IALA
Traffic clearance service	urn: mrn: iala: techsvc[1]	The service provides vessels with permission to proceed, impose conditions or deny clearance.	IALA
Anchorage assignment service	urn: mrn: iala: techsvc[1]	The service assists ships into anchorage positions by assigning anchorage areas/positions.	IALA

Note:
[1]   To be defined in due course.

1.9   Relation to other Maritime Services

This Maritime Service has a close relationship with nearly all other Maritime Services as several information elements delivered in the service could also be provided as part of other Maritime Services. Areas of overlap, such as Vessel shore reporting (MS 8), Meteorological information service (MS 14) or Maritime safety information service (MS 5) should be taken into consideration during the implementation of this service.

MS 2 – Aids to navigation service

2.1   Submitting organization

IALA

2.2   Coordination body

IMO and IALA

2.3   Description of the Maritime Service

This Maritime Service describes the provision of aids to navigation (AtoN) deployed to enhance the safety of navigation.[2]

IALA defines an AtoN as a device, system or service, external to vessels, designed and operated to enhance safe and efficient navigation of individual vessels and/or vessel traffic. For the purposes of this service description, positioning, navigation and timing (PNT) services are included. However, the description of vessel traffic services (VTS) is contained in a separate Maritime Service.

2.3.1   IALA maritime buoyage system

The maritime buoyage system (MBS) contains descriptions of AtoN systems used worldwide for all users. The MBS is comprised of fixed and floating visual marks and devices. This is primarily a physical system; however, all of the marks may be complemented by electronic means.

Within the MBS there are six types of marks, which may be used alone or in combination. Mariners can distinguish between these marks by identifiable characteristics. As described below, lateral marks differ between Buoyage Regions A and B, whereas the other five types of marks are common to both regions.

There are four AtoN applications:

- Fixed;

- Floating;

- Mobile (MAtoN); and

- Electronic (AIS AtoN, radar beacon (Racon) and radar target enhancer).

Determining the proper application of a navigational mark or signal involves:

- balancing the benefits derived from new and advancing technologies against safety and security concerns;

- the impact on the environment and on international trade facilitation; and

- the potential costs to the industry, and finally their impact on personnel, both on board and ashore.

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[2]   AIS-ASM (Application-Specific Messages) is not included in the MS 2 description.

2.3.2   Positioning, navigation and timing services

PNT services are considered to be the services provided to allow the mariner, or an aid to navigation, to calculate their position, or to receive precise time. References to PNT data are considered to be the use of such derived position and time data within the AtoN or the vessel's receiver.

It is useful to recognize that some AtoN use PNT data, while others can provide PNT services for use by others. Examples of such can be the use of GNSS within AtoN AIS or the provision of positioning information via Racons, or augmentation data. Based on this, the Maritime Service only considers PNT aspects within the remit of the AtoN service provider.

2.4   Purpose

To promulgate the latest information on AtoN and augment charted AtoN information on an appropriate shipborne navigation display prior to updates to the nautical chart.

2.5   Operational approach

This document deals primarily with the provision of AtoN services and related IALA S-200 series product specifications designed to convey updates and information to augment an ENC. A current listing and descriptions of existing (or under development) IALA S-200 series product specifications may be found here.

2.6   User needs

Users will include mariners and shoreside authorities. User needs may include the most up-to-date presentation of information on:

- new hazards (fixed or dynamic);

- temporary channels or routes;

- temporary areas to be avoided (e.g. restricted areas (i.e. military exercises), survey, dredging, fishing, special marine events);

- changed hydrography, such as shifting banks;

- temporary replacement of a charted aid that is off station or removed;

- dynamic areas (e.g. reduced visibility, presence of protected species);

- polar navigation, provided there is sufficient means of radio communication broadcast and charting;

- ice conditions and navigation;

- incident response (e.g. environmental, search and rescue);

- port-specific applications (e.g. passage planning, amended pilot boarding location);

- measures for the protection of the marine environment;

- security;

- PNT information on position in real time (timing is a critical component in the provision of some AtoN services, and the need to synchronize and reference radionavigation signals to universal coordinated time (UTC) will increase as look to use more diverse systems and solutions); and

- PNT integrity (recognizing the vulnerability of radionavigation systems to interference (e.g. GNSS jamming); the use of multiple dissimilar positioning and timing systems is required to achieve resilience in support of safe navigation and the optimal working of AtoN).

2.7 Information to be provided

2.7.1 General

The AtoN information product specifications (S-201, S-240, S-124 and S-125) provide a common structure for the exchange of information about AtoN. The product contains the positions, properties, operational status and general comments related to an AtoN.

The Product Specification can be used to exchange AtoN information in a consistent form between aids to navigation authorities, hydrographic offices and other organizations, including commercial and professional agencies.

2.8 Associated technical services

Name	ID (MRN)	Description	Standardization body
Provision of AtoN information service to end users	urn:mrn:iala:techsvc: spec:atoninfo[1]	Using the data model from the S-125 product specification	IALA (IHO)
Navigational warnings service	urn:mrn :iho[2]	Using the data model from the S-124 product specification	IHO
Enhanced AtoN information for AtoN authorities	urn:mrn:iala:techsvc:sp ec:enhancedaton[1]	Using the data model from the S-201 product specification	IALA
PNT information	urn:mrn:iala: techsvc[2]	Using the data model from the S-240 product specification	IALA

Note: the technical service specifications listed are under development.

[1] *Not official designation, for example only.*
[2] *To be defined in due course.*

2.9   Relation to other Maritime Services

MS 2 has a relationship with other Maritime Services where it affects AtoN.

Examples may be different depending on coastal State arrangements.

Description	Examples of information related to MS 2
MS 1 Vessel traffic service	Navigational hazard, exchange of routes, navigational advice and assistance, waterway management
MS 4 Port support service	ETA/ATA, access to the port, availability of port services
MS 5 Maritime safety information service	MSI information
MS 6 Pilotage service	Pilot and boarding arrangements
MS 7 Tug service	Update on information
MS 8 Vessel shore reporting	Position information
MS 9 Telemedical assistance service	Vessel's position, delays, weather information
MS 10 Maritime assistance service	Notifications, routeing, places of refuge
MS 11 Nautical chart service	Local Area updates, chart updates
MS 12 Nautical publications service	Updates to publications
MS 13 Ice navigation service	Ice routes, ice conditions, ice-breaking assistance
MS 14 Meteorological information service	Weather information
MS 15 Real-time hydro and environmental information service	Horizontal and vertical tidal information in VTS area, available water column
MS 16 Search and rescue service	Search pattern and vessel of opportunity

MS 3 – (Reserved for future use)

(Intentionally left blank)

MS 4 – Port support service

4.1   Submitting organization

IHMA

4.2   Coordinating body

IHMA and IMO

4.3   Description of the Maritime Service

Port support service (PSS) is defined as a digital service in support of a ship calling at a port. It provides information necessary to organize and support the port call and a PSS varies depending on local needs. PSS may relay information from related nautical, vessel or cargo services and may incorporate other services if the respective Maritime Service is not available at a port. Examples of PSS include:

Nautical data

Definition: Data that is provided by hydrographic offices in navigational charts, sailing directions or coast pilots, and tide tables.

Nautical port data to be provided to hydrographic offices and port users:

- Port infrastructure in nautical charts and sailing directions.

- Port depths in nautical charts.

- Port information in sailing directions.

Operational data

Definition: Data that is submitted to non-authority parties as part of the planning or execution of certain operations.

Operational data to be provided to port users:

- Arrival and departure times at berth and pilot boarding place.

- Starting and completion times of vessel and cargo services.

4.4   Purpose

PSS will provide detailed information on available services at the port of call. It will enable the ship or its representatives, like the operational centre of a shipping line or shipping agents, to plan and prepare for a port call. It will also allow users to request required services and enable tracking of the progress of the services during a port call.

PSS will enable the actors within a local port to receive data from an approaching ship in order to provide appropriate and timely support to a port call and enable coordination of the different aspects of the port call with the local actors involved.

4.5   Operational approach

PSS will be defined by analysing the local services available at the individual port. This analysis will establish which, if any, related Maritime Services are available locally and do not need to be included in PSS. Those services determined to be included in PSS will be clearly defined and made available for related actors to understand which services are included in the given implementation of PSS.

It will then be defined which data streams are used to organize PSS. It will also include the different methods used to exchange the necessary information between ships and ports and between the different actors within the port.

4.6   User needs

Nautical data

User case

- Port infrastructure in nautical charts: Masters are obliged to navigate berth to berth by using official nautical charts and sailing directions to fulfil SOLAS voyage planning requirements. This is however a challenging undertaking if the terminal, berth or berth position is not displayed in the nautical chart, or if the information differs between, e.g. the nautical chart and the sailing direction. Shipping lines have requested to improve the quality and availability of nautical port information.

- Port depths in nautical charts: Masters have difficulties in optimizing the deadweight of the vessel and applying a safe under-keel clearance if local depths are different from a nautical chart or if the under-keel clearance definitions are different.

- Port information in sailing directions: voyage planning is difficult if local port information books are different from sailing directions.

Relation to resolutions

- Resolution A.893(21): berth-to-berth navigation.

- Resolution A.862(20): recommended contents of port information books.

Impact on IMO objectives:

- Safety: most incidents happen in the approaches, anchorages or harbour basins of ports, as this is by far the busiest time for the seafarer and vessel. Therefore, the quality and the availability of relevant and up-to-date port information is an important risk mitigation strategy as it will help the seafarer to execute safe navigation from pilot boarding place to berth and vice versa.

- Environment: most emissions from shipping originate at sea. If the charterer can charter the right ship with an optimized amount of cargo on board based on the maximum allowed dimensions in both the load and discharge port, this is already an improvement in emission savings per carried tonne of cargo.

- Security: to have a correct understanding at which port facility the ship has been and to which port facility it is sailing, is important for the correct ISPS measures.

Operational data

User case

- Masters have to optimize their speed, which is a challenging job if the requested time of arrival at the pilot boarding place is not available, as ports tend to serve ships on a "first come, first served" basis or if the requested time of arrival differs between ship agent, terminal, port authority or vessel traffic services.

- Masters have to comply with the Maritime Labour Convention, stipulating sufficient rest hours for crew, which is a challenging job if cargo and vessel services are started or completed without notification. Crew rest hours are especially affected in large ports with many different services.[3]

- Safety: most incidents happen in the approaches, anchorages or harbour basins of ports, as this is by far the busiest time for the seafarer and vessel. By spending less time in anchor areas and/or close to pilot boarding places with a high density of traffic, there is less risk. Improved compliance with the Maritime Labour Convention due to improved rest hour planning also serves safety.[4]

- Environment: most emissions from shipping originate at sea.[5] If the master can optimize the speed, this will result in emission savings per sailed mile. Also, by reducing the time spent at anchor, there will be less hull fouling, again resulting in less fuel consumption.

- Security: by reducing the time at anchor and allowing the ship to be in the queue before it arrives, there will be less risk of piracy in affected areas.

4.7 Information to be provided

Name	Description	Standardization body
Nautical data: • Port depths and water levels • Port infrastructure • Port information	Data that is provided by hydrographic offices in navigational charts, sailing directions or coast pilots, and tide tables. Data standard can be IHO S-131	IHO
Operational data: • Arrival and departure times at berth and pilot boarding place • Starting and completion times of vessel and cargo services	Data that is submitted to non-authority parties as part of the planning or execution of certain operations.	• IMO reference data model for non-technical standards • ISO TC8 for technical standards

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[3]   ICS study on rest hours in ports.

[4]   Report on accidents due to fatigue.

[5]   https://www.motorship.com/news101/industry-news/study-highlights-cost-of-lengthy-port-stops

4.8 Associated technical services

Name	Description	Standardization body
Nautical data	• Port infrastructure data • Port depths • Port information	IHO
Operational data	• Arrival and departure times at berth and pilot boarding place • Starting and completion times of vessel and cargo services	• IMO reference data model for non-technical standards • ISO TC8 for technical standards

4.9 Relation to other Maritime Services

To achieve the purposes listed in point 4, information from several Maritime Services can be utilized.

The following services are related to MS 4:

Maritime Service	Examples of information related to MS 4
MS 1 – Vessel traffic service	VTS area, types of VTS services, VTS contact information, places of refuge, local regulations, limitation, visibility, information regarding traffic in the area.
MS 6 – Pilotage service	Contact information, regulations, local restrictions, pilot meeting point, passage plan, pilot request and allocation.
MS 7 – Tug service	Tug contact information, tug allocation, tug capacity, tug requirement.
MS 8 – Vessel shore reporting	Cargo, crew list, FAL form, ETA/ATA, ETD/ATD, waste, HAZMAT, passenger list.
MS 10 – Maritime assistance service	Contact information.
MS 11 – Nautical chart service	Local area updates, chart updates and information critical for safe navigation.
MS 12 – Nautical publications service	Updates to publications regarding port information.
MS 13 – Ice navigation service	
MS 14 – Meteorological information service	Local weather phenomena, climatic information, wave information.
MS 15 – Real-time hydrographic and environmental information services	Information from real-time sensors providing tidal and current information.

MS 5 – Maritime safety information Service

5.1   Submitting organizations

IHO and WMO

5.2   Coordinating bodies

IMO, IHO and WMO

5.3   Description of the Maritime Service

This Maritime Service describes the provision of navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships. The maritime safety information (MSI) service is the internationally and nationally coordinated network of broadcasts containing urgent information which is necessary for safe navigation, received in ships by equipment which automatically monitors the appropriate transmissions, displays information which is relevant to the ship and provides a print capability.

5.4   Purpose

The purpose of this Maritime Service is to provide the mariner with information related to navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages.

The provision of MSI makes available to mariners, prior to and during voyages, information that improves their situational awareness and assists with safety of navigation.

The promulgation of MSI is defined in SOLAS chapter IV as part of the Global Maritime Distress and Safety System (GMDSS) and in resolution A.705(17), as amended, on *Promulgation of maritime safety information*.

SOLAS regulations V/4 through V/7 govern the Contracting Government's responsibilities with regard to providing MSI.

The revised Joint IMO/IHO/WMO Manual on MSI, Publication S-53 (the Joint Manual on MSI), describes the provision of the service and the receiving methods in more detail.

The delivery methods are described in the *International SafetyNET Services Manual* (MSC.1/Circ.1364, as revised) and in the *International Iridium SafetyCast Service Manual* (MSC.1/Circ.1613, as revised).

The roles and responsibilities of a METAREA Coordinator are defined in resolution A.1051(27), as amended, on *IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document*, and the provision of marine meteorological services is guided by WMO No.558 (Manual on Marine Meteorological Services) and WMO No.471 (Guide to Marine Meteorological Services).

Services that constitute the Maritime Service are currently provided in a fully electronic format and, as such, there is no requirement to transition from analogue to digital information provision. Additional analogue (voice) services do exist but there is no intent to transition these to digital services.

5.5   Operational approach

The MSI service, as defined in resolution A.705(17), as amended, is the internationally and nationally coordinated network of broadcasts containing information which is necessary for safe navigation, received in ships by equipment which automatically monitors the appropriate transmissions, displays information which is relevant to the ship and provides a print capability. This concept is illustrated in the figure below:
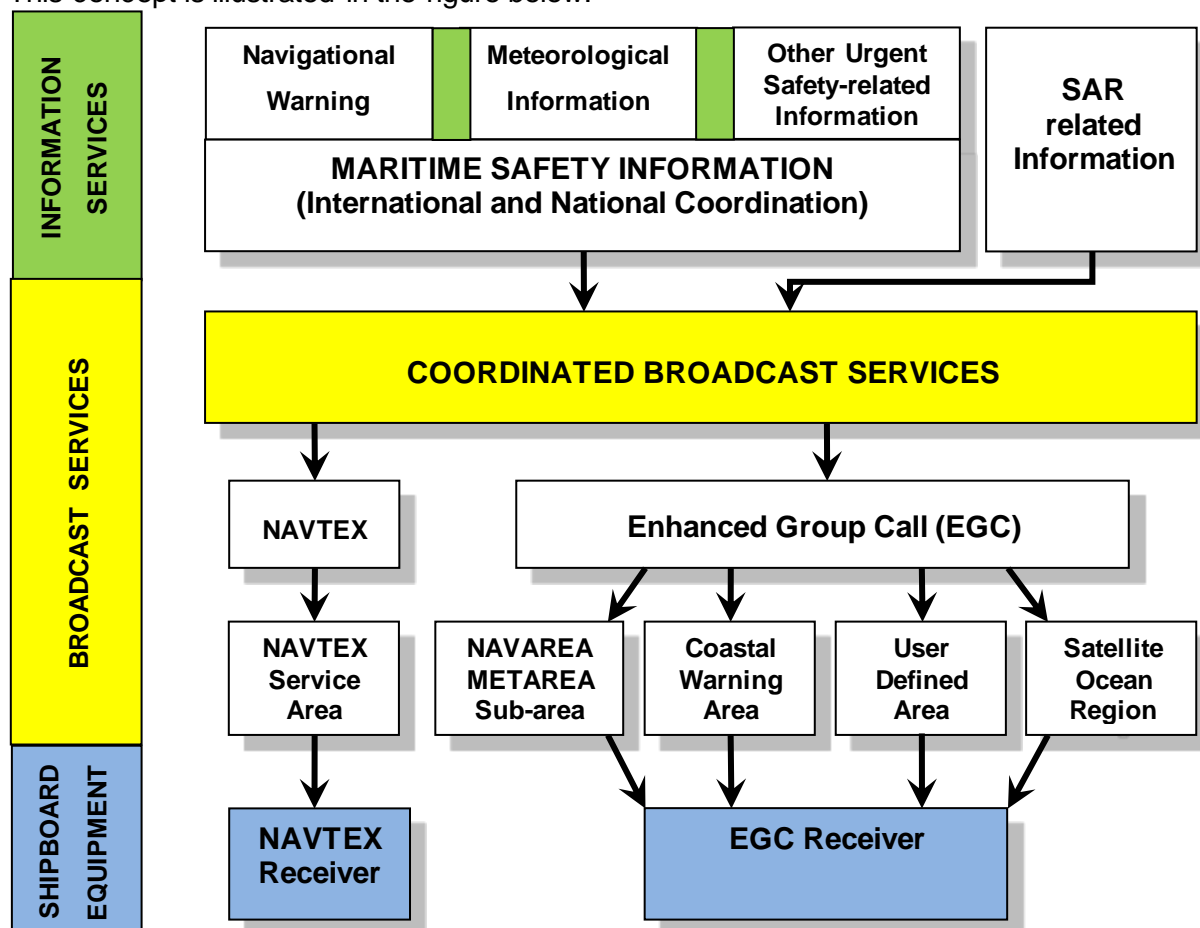

Figure 5-1: The maritime safety information service of the
Global Maritime Distress **and Safety System**
(Source: S-53)

Within the GMDSS, MSI is promulgated to defined areas that are managed by area coordinators as illustrated in the figures below:
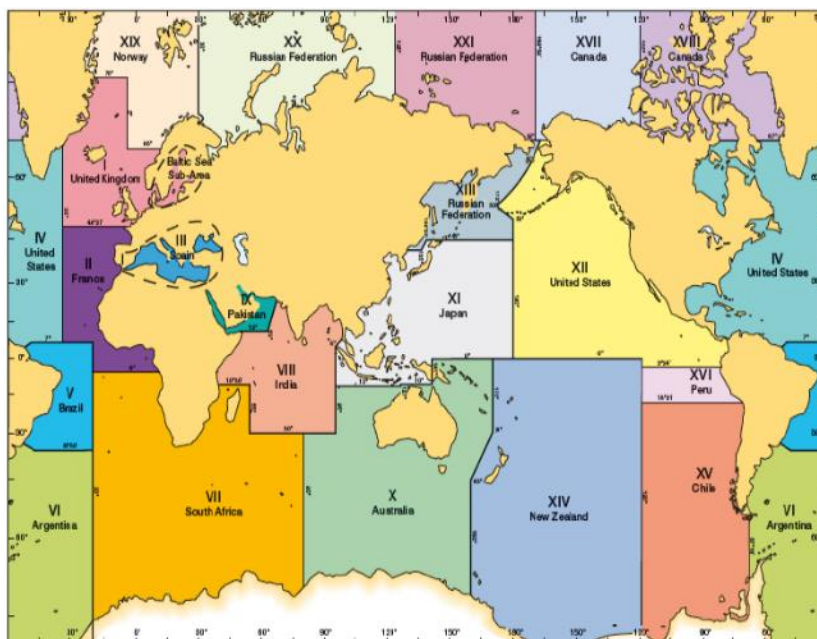

**Figure 5-2: NAVAREAs for coordinating and promulgating navigational warnings
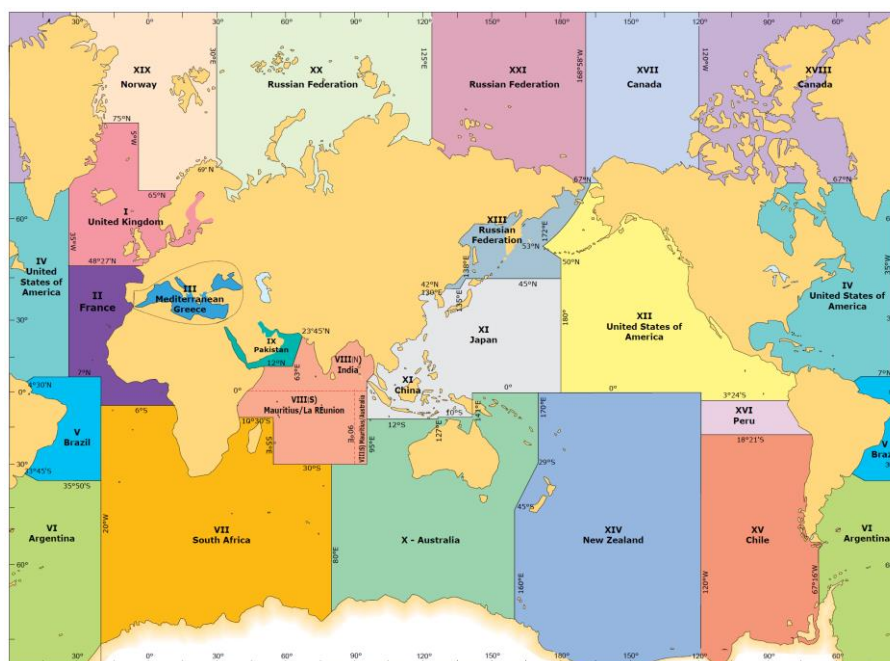under the World-Wide Navigational Warning Service
(Source: S-53)**

**Figure 5-3: METAREAs for coordinating and promulgating meteorological warnings
and forecasts under the World-Wide Met-Ocean Information and Warnings Service
(Source: S-53)**

5.6 User needs

To meet the needs of GMDSS users, NAVAREA, METAREA and National MSI Coordinators promulgate MSI to their respective areas of responsibility via approved GMDSS methods as follows:

Typical MSI services and delivery:

Information	Area	Service Delivery
Navigation warning	NAVAREA	EGC/HF NBDP
Navigation warning	Coastal warning area	NAVTEX/EGC
Meteorological warnings and forecasts	METAREA	EGC/HF NBDP
Meteorological warnings and forecasts	Coastal warning area	NAVTEX/EGC

To meet the needs of non-GMDSS users, NAVAREA, METAREA and National MSI Coordinators may promulgate MSI to their respective areas of responsibility via other methods as follows:

Information	Area	Service Delivery
Navigation warning	NAVAREA	HF voice
Navigation warning	Coastal warning area	VHF/ MF voice
Meteorological warnings and forecasts	METAREA	HF voice
Meteorological warnings and forecasts	Coastal warning area	VHF/ MF/HF voice
Navigational warning	NAVAREA and coastal warning area	Web service
Meteorological information	METAREA and coastal area	Web service

Potential future services/delivery methods:

Information	Area	Service Delivery
Navigation warning	NAVAREA	VDES-SAT
Navigation warning	Coastal	VDES-TER AIS-SRM
Meteorological warnings and forecasts	NAVAREA	VDES-SAT
Meteorological warnings and forecasts	Coastal	VDES-TER AIS-SRM (warnings) AIS-ASM (forecasts)

5.7 Information to be provided

MSI services, as listed in resolution A.706(17), as amended, on *IMO/IHO World-Wide Navigational Warning Service – Guidance Document* for hazards to navigation, the Manual on Marine Meteorological Services and in the Joint Manual on MSI for marine weather warnings and forecasts are listed below.

Information related to:	Examples:[6]
Hazards to navigation	.1 casualties to lights, fog signals, buoys and other aids to navigation affecting main shipping lanes; .2 the presence of dangerous wrecks in or near main shipping lanes and, if relevant, their marking; .3 establishment of major new aids to navigation or significant changes to existing ones, when such establishment or change might be misleading to shipping; .4 the presence of large unwieldy tows in congested waters; .5 drifting hazards (including derelict ships, ice, mines, containers, other large items over 6 metres in length, etc.); .6 areas where search and rescue (SAR) and anti-pollution operations are being carried out (for avoidance of such areas); .7 the presence of newly discovered rocks, shoals, reefs and wrecks likely to constitute a danger to shipping, and, if relevant, their marking; .8 unexpected alteration or suspension of established routes; .9 cable or pipe-laying activities, the towing of large submerged objects for research or exploration purposes, the employment of manned or unmanned submersibles, or other underwater operations constituting potential dangers in or near shipping lanes; .10 the establishment of research or scientific instruments in or near shipping lanes; .11 the establishment of offshore structures in or near shipping lanes; .12 significant malfunctioning of radionavigation services and shore-based maritime safety information radio or satellite services; .13 information concerning events which might affect the safety of shipping, sometimes over wide areas, e.g. Naval exercises, missile firings, space missions, nuclear tests, ordnance dumping zones, etc. It is important that where the degree of hazard is known, this information is included in the relevant warning. Whenever possible such warnings should be originated not less than five days in advance of the scheduled event and reference may be made to relevant national publications in the warning; .14 acts of piracy and armed robbery against ships; .15 tsunamis and other natural phenomena, such as abnormal changes to sea level; .16 World Health Organization (WHO) health advisory information; and .17 security-related requirements.

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[6] Examples from resolution A.706(17), as revised, Document Review Working Group 2018, and the Manual on Marine Meteorological Services.

Information related to:	Examples:[6]
Marine weather warnings and forecasts	**For high seas areas:** Forecasts shall include wind parameters, sea state and visibility. Warnings shall be provided for the following phenomena: • wind warnings of gale force (Beaufort force 8) and above; and • ice accretion. **For coastal areas:** Forecasts shall include wind parameters, waves (sea and swell) and ice accretion where applicable. Warnings shall be given for the following phenomena: • winds of gale force (Beaufort 8) and above; • potentially hazardous ice accretion; and • unusual and hazardous sea-ice conditions. Warnings should be given for the following phenomena: • near gales (Beaufort force 7); • severe thunderstorms/squall lines; • restricted visibility (one nautical mile or less); • storm-induced water level changes; and • tsunamis.

5.8   Associated technical services

Two principal methods are used for broadcasting MSI in accordance with the provisions of the SOLAS Convention, as amended, in the areas covered by these methods, as follows:

- NAVTEX: broadcasts to coastal waters; and

- Enhanced group call services (EGC) (e.g. SafetyNET, SafetyCast), provided by a recognized mobile satellite service provider.

Additionally, HF NBDP may be used to promulgate MSI to Sea Area A4 (SOLAS regulation IV/7.1.5).

Ships are required to be capable of receiving MSI broadcasts for the area in which they operate in accordance with the provisions of the SOLAS Convention, as amended.

Method	ID (MRN)	Description	Standardization body
EGC services		Delivery of MSI via recognized mobile satellite services	Resolution A.1001(25)
NAVTEX		Delivery of MSI via NAVTEX	ITU-R M.540
HF NBDP		Delivery of MSI via HF NBDP	ITU-R M.688 Resolution A.700(17)
Web platforms		Display of MSI and access to MSI data files	

S-100 format messaging will be used to pass MSI for display in ECDIS (specifically S-124, S-411 and S-412 standards).

5.9 Relation to other Maritime Services

MS 5 has relationships with other Maritime Services for the delivery of safety information.

Examples may be different depending on the coastal State arrangements.

Maritime Service	Examples of information related to MS 5
MS 1 – Vessel traffic service	VTS provider
MS 4 – Port support service	Local port/harbour authority
MS 11 – Nautical chart service	National hydrographic authority/ organization
MS 13 – Ice navigation service	National competent authority organization
MS 14 – Meteorological information service	National meteorological authority public institutions
MS 15 – Real-time hydrographic and environmental information services	National hydrographic and meteorological authorities
MS 16 – Search and rescue service	SAR authorities

MS 6 – Pilotage service

6.1   Submitting organization

IMPA

6.2   Coordinating bodies

IMO and IMPA

6.3   Description of the Maritime Service

Ships proceeding or leaving a port or a specific area should have easy access to information regarding the pilotage service provided. Information such as local regulations, contact, notices, means of boarding, boarding point, limitations or pilot booking procedure, could be accessible by electronic means, where available.

The information provided through this service is not piloting information as pilotage is a service physically performed on board ships by duly qualified and certificated or licensed maritime pilots.

6.4   Purpose

This Maritime Service is limited to information provided to ships regarding the pilotage service in a given geographic area. It does not address the act of piloting, which is provided by a pilot on the bridge of a ship.

The purpose of this Maritime Service is to provide information related to the pilotage service when planning an operation before the pilot boards the vessel, by using modern technology and common standards.

6.5   Operational approach

Pilot organizations providing pilotage service in an area could provide information to ships about the pilotage service in a digital and easily accessible way. The information could be, as an example, portrayed as a layer on the ECDIS or in a graphical display. This information could include, for inbound ships, the location of the pilot station(s) or boarding point(s) in latitude/longitude or distance and bearing from a location, or marked by an aid to navigation. In addition, the transmitted information could include the VHF channels to contact the pilot or pilot boat. Typically, the Pilotage service information will not be provided by the pilot, but rather by the pilot organization, because the pilot must be engaged in the actual performance of his or her pilotage duties.

Examples of information can be:

Information related to:	Examples
General information	Examples of information: • pilot requirements in the area; • local regulations; • limitations; • requirements and procedures for ordering the pilot; • requirements and procedures for pilot boarding; • contact information to pilot station; • mandatory needs for tug assistance; and • pilot boarding point.
Operational information	Examples of information: • contact to pilot boat, launch, helicopter; • position of pilot station, pilot boat; • required arrangements for pilot boarding; • boarding speed; • communication; • set up of ship's radar, ECDIS and other equipment as requested for the pilot's use; and • any other actions requested of the ship for the pilot's benefit.

6.6   User needs

Ships are concerned by this service and need to know the pilot boarding/disembarking position, the pilot request procedures, local and special regulations and the compulsory use of tugs.

6.7   Information to be provided

See section 6.4.

6.8   Associated technical services

(to be further developed)

6.9   Relation to other Maritime Services

MS 6 has relationships with other Maritime Services where it affects the pilot boarding operation and contributes to safe and efficient operations.

(to be further developed)

MS 7 – Tug service

7.1   Submitting organization

Correspondence Group on the Review of the Descriptions of Maritime Services (FAL Committee).

7.2   Coordinating bodies

IMO and Norway.

7.3   Description of the Maritime Service

This MS is intended to improve information regarding information about tug services needed in an area or port.

The need for tug services differs from port to port, the type of vessel and cargo.

Traditionally, the user has received information from different sources. The Web is becoming more and more common. But there is still some information in analogue publications, from ship agents, VTS and operators.

In some cases, information about a tug service capacity and/or availability may be difficult to obtain owing to communication deficiencies.

Tug and escort vessels range from small vessels with limited capacity and service in ports and rivers to ocean-going vessels built for complex operations and salvage. Service from tug and escort vessels contributes to the safety of navigation, protection of the marine environment, and efficiency of marine transportation by conducting different types of operations, such as:

- transportation (personnel and staff between port and anchorages)

- ship assistance (e.g. mooring)

- salvage (grounded ships or structures)

- shore

- towage (harbour/ocean)

- escort

- oil spill response

Tug services would encompass all kinds of tug propulsion systems, such as:

- conventional

- azimuth stern drive

- tractor

- rotor

7.4   Purpose

This MS aims to facilitate access to all necessary tug-related information required by ships heading to port, in order to optimize transit times and promote efficient movement of goods and persons by using modern technology and common standards.

Effective communications and exchange of information between relevant stakeholders would contribute to efficient tug services. Electronic exchange of information would significantly contribute to the improvement of this service. For example, notifying a master and officers in advance about tug availability in-port could lead the ship to adapt its speed accordingly. In some cases, this may prevent a requirement to anchor the ship.

Increased connectivity, through sharing of harmonized digital information regarding tug operations in ports, rivers or deep-sea, will enhance efficiency through just-in-time services. It will also reduce human factor errors, such as language barriers or outdated information in publications, enhancing efficiency and access to information in a fast and easy-to-use manner.

7.5   Operational approach

Access to this information electronically would enhance the awareness of a ship's timestamp.

Like the port support service, the utilization of a common platform to exchange information electronically and keep users updated on a regular basis about the status of operations would significantly improve this service, for both the ship's operator and the tug owners. The tug service aims mainly to improve the communications involved in a ship request, rather than altering current operational procedures. Some of these data elements may include:

- ship's size

- number of tugs required

- date/time the service is required

- date/time the tug may be on-site

- estimated duration of operations
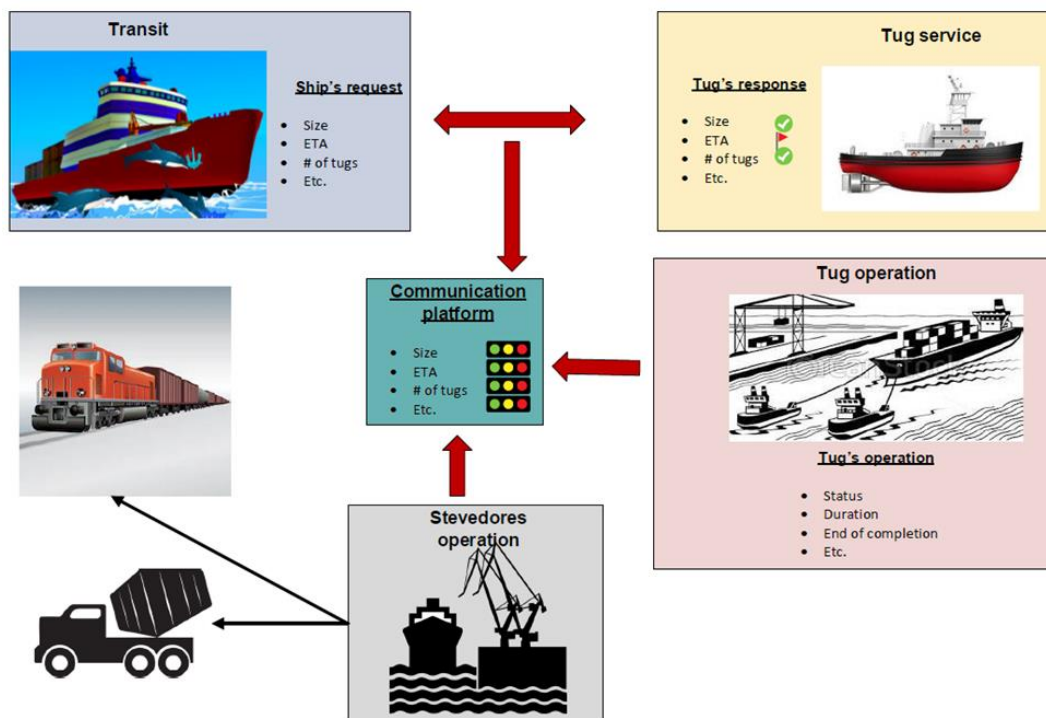
- end of operations

**Figure 7-1: Example of an electronic communication platform
for all actors involved in the tug operations**

7.6   User needs

Tug operations are a key element of the marine transportation chain and well-coordinated procedures and communication means should be in place to ensure fluid movement of ships.

In the future, a single window reporting system can contribute to reducing the workload and human errors by facilitating the exchange of information needed for tug requests and operational coordination.

The types of information which can be exchanged include:

- ETA (request)

- confirmation requests

- updates on transit status and tug availability

- updates among stakeholders

- standardized messages to overcome language barriers

Easy and timely access to tug service information is crucial to ensure fluidity in the transportation chain. The information required from this service is mainly related to:

- capacity

- availability

- time of response

- status of operations

- duration of operations

Easy and timely access to tug service information can be achieved if this information is included in a common digital environment, such as a single window reporting system.

In return, tug services should be regularly updated on the ship's ETA/ATA to plan their operations accordingly. In the event of an unanticipated change, the tug service and ship officers should be able to communicate easily with each other to keep both parties informed about the evolving situation and allow for proper decision-making. An easy communication link should be part of user needs and this communication link would also benefit all other actors.

7.7　　Information to be provided

Information related to:	Examples of information shared in a tug service
Deep-sea information	- Contact information for tug vessel/operator - Safety procedures and regulations - Available resources - Working hours
Local port or river information	- Contact information for tug vessel/operator - Mooring and berthing information - Available resources - Working hours
Tug information	- Type of tug - Bollard pull - Size - Assistance services - Response time - Contact information - Working hours

Table 7-1: Examples of information that can be shared in a tug service

7.8　　Associated technical services

(To be developed)

7.9   Relation to other Maritime Services

Maritime Service	Examples of information related to MS 7
MS 1 – Vessel traffic service	VTS area, VTS contact information, places of refuge, local regulations, limitation, visibility, information regarding traffic in the area, traffic clearance, time slots
MS 4 – Port support service	Berthing information, time slots, security, local regulations, supply, assistance, port contact information
MS 5 – Maritime safety information service	Navigational warnings, meteorological information and other urgent safety-related information
MS 6 – Pilotage service	Pilot regulations, contact information, request procedures
MS 8 – Vessel shore reporting	Vessel information, cargo information, crew information
MS 10 – Maritime assistance service	Contact information, places of refuge
MS 11 – Nautical chart service	Charting information, chart updates
MS 12 – Nautical publications service	Digital information from nautical publications that is relevant to the operations at hand
MS 13 – Ice navigation service	Ice chart, ice conditions, information regarding icebreaker service/assistance, ice routes
MS 14 – Meteorological information service	Information regarding weather in the area
MS 15 – Real-time hydrographic and environmental information services	Information from real-time sensors providing tidal and current information
MS 16 – Search and rescue service	Salvage information, drifting parts, SAR areas, and rescue capabilities in the area

MS 8 – Vessel shore reporting

8.1   Submitting organization

FAL Committee, NCSR Sub-Committee

8.2   Coordinating bodies

IMO, Norway and Singapore.

8.3   Description of the Maritime-Service

This MS provides information exchanges between shore and ship. It covers both:

.1   ship-to-shore reporting typically connected to port calls; and

.2   ship reporting systems linked to the safety of navigation.

The first is closely linked to the MSW concept in the FAL Convention of the Organization-and the second, ship reporting systems as defined in SOLAS regulation V/11, is closely linked to ships' routeing.

Ship reporting systems can be mandatory or non-mandatory. If so adopted by IMO, a ship reporting system will be mandatory for use by all ships, certain categories of ships, or ships carrying certain cargoes.

Ship-to-shore reporting

This service can cover information and guidelines related to reporting formalities and instructions (when, what and how) for reporting to a specific port. In addition, this service can be extended to the full exchange of information required in a single window ship reporting system. Information in a ship-to-shore reporting regime may contain the following elements:

- reporting formalities

- information requested through a single window system

- security regulations

- vessel traffic services zones regulations

- customs regulations

- immigration regulations

- port State regulations

- health and veterinary regulations

- environmental regulations

Many of these elements are addressed by the IMO Facilitation Committee (FAL Committee), which developed guidelines for setting up a maritime single window reporting system. The FAL Committee also maintains and extends the IMO Compendium on Facilitation and Electronic

Business (IMO Compendium),[7] a tool for software developers that design the systems needed to support transmission, receipt and response via electronic data exchange of information required for the arrival, stay and departure of the ship, persons and cargo to a port. By harmonizing the data elements required during a port call and by standardizing electronic messages, the IMO Compendium facilitates the exchange of information ship to shore and the interoperability of single windows, reducing the administrative burden for ships linked to formalities in ports.

The IMO Compendium consists of an IMO Data Set and IMO Reference Data Model agreed by the main organizations involved in the development of standards for the electronic exchange of information related to the FAL Convention: World Customs Organization (WCO), United Nations Economic Commission for Europe (UNECE) and International Organization for Standardization (ISO). The IMO Compendium includes new areas beyond the FAL declarations such as the reporting of stowaways, the Maritime Declaration of Health, ship and company certificates and inspections and timestamps related to the port call and the provision of relevant services in the port. A data set on ship reporting systems has also been included in the IMO Compendium.

This work is linked to e-navigation Strategy Implementation Plan Solution 2 – Means for standardized and automated reporting (see MSC.1/Circ.1595, as revised).

E-navigation solution 2, regarding automated ship reporting, is one of the most important solutions to reduce the crew workload (amount of time spent on preparing and submitting reports to shore-based authorities). To achieve this, reports should be automatically generated and transmitted as far as possible from existing onboard systems. Data fields within the single window, where possible, should also be auto populated from onboard and shore systems, for the vessel master to do a simple verification check before sending via the appropriate communication means.

Ship-to-shore reporting as envisaged by e-navigation solution 2 aims to reduce time-consuming paperwork on board.

This service can facilitate the necessary needs related to a single window reporting system that also includes automation.
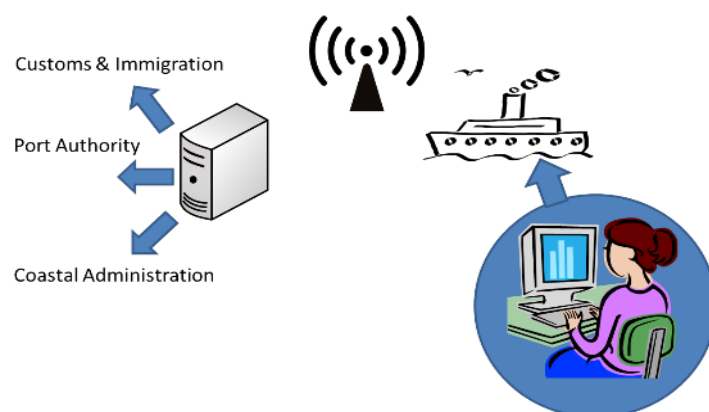

Figure 8-1: Ship-to-shore reporting

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[7]   The IMO Compendium on Facilitation and Electronic Business

Ship reporting systems

The practice of following predetermined routes for shipping is adopted for reasons of safety. Related provisions were subsequently incorporated into the original SOLAS Convention. Traffic separation schemes (TSS) and other ships' routeing systems have now been established in many of the major congested shipping areas of the world. IMO's responsibility for ships' routeing is enshrined in SOLAS chapter V, which recognizes the Organization as the only international body for establishing such systems.

Ships' routeing systems, including TSS, that have been adopted by IMO may be tightly linked to ship reporting systems. SOLAS regulation V/11 provides the authority for the adoption of ship reporting systems by IMO.

The IMO publication *Ships' Routeing* is updated regularly. There are currently 23 IMO-adopted **ship reporting systems**. In addition, a number of local ship reporting systems are established.

The reporting obligations in a ship reporting system are typically fewer than in a ship-to-shore reporting regime, e.g. vessel name, IMO identification number, position, speed, course and so on. However, parts of the information are the same or similar. Currently, much of the ship reporting is done via voice communications and/or paper.

Resolution MSC.433(98) on *Guidelines and criteria for ship reporting systems* recalls that communication between a shore-based authority and a participating ship should be limited to information essential to achieving the objectives of the ship reporting system. The initial report required from a ship entering the system should generally be limited to:

- ship's name

- call sign

- IMO identification number if applicable

- position

The existing resolution is based on SOLAS regulation V/11, as follows:

"1   Ship reporting systems contribute to safety of life at sea, safety and efficiency of navigation and/or protection of the marine environment. A ship reporting system, when adopted and implemented in accordance with the guidelines and criteria developed by the Organization pursuant to this regulation, shall be used by all ships, or certain categories of ships or ships carrying certain cargoes in accordance with the provisions of each system so adopted.

2   The Organization is recognized as the only international body for developing guidelines, criteria and regulations on an international level for ship reporting systems. Contracting Governments shall refer proposals for the adoption of ship reporting systems to the Organization. The Organization will collate and disseminate to Contracting Governments all relevant information with regard to any adopted ship reporting system."

Although the regulation refers to safety of life at sea, safety and efficiency of navigation and/or protection of the marine environment, resolution MSC.433(98) states that other supplementary information may also be requested in the initial report, if justified to ensure the effective operation of the ship.

This information may include the intended movement of the ship through the area covered by the reporting system and any operational defects or difficulties affecting the ship, as well as the general categories of any hazardous cargoes on board.

Information required to be transmitted as part of a ship reporting system report is generally transmitted to the VTS centre, or the relevant authority, via VHF voice communication. Some ship reporting systems also accept reports transmitted through AIS, Internet-based reporting systems, email, fax, Satcom, mobile phone or a combination of these communication means.
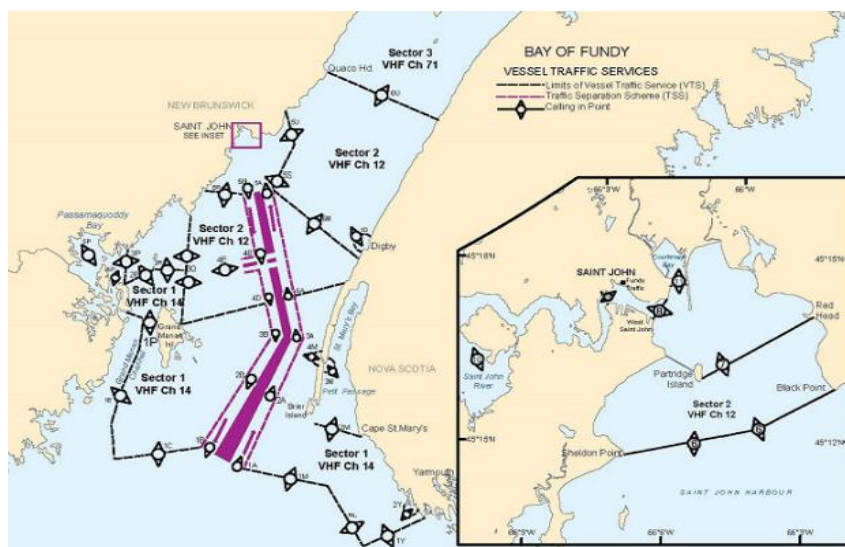

Figure 8-2: Examples of reporting points from Bay of Fundy

Current communication systems

Currently, the following communication systems are normally used to report information:

- AIS

- Internet-based reporting systems

- Email

- Fax

- SATCOM

- Mobile phone
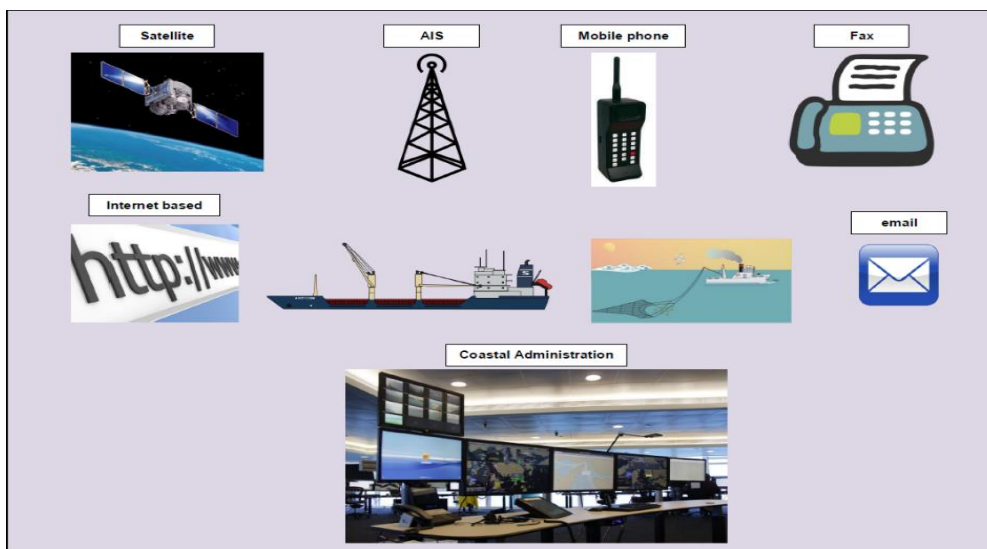
- A combination of these systems

**Figure 8-3: Examples of current communication systems
used to report information**

8.4 Purpose

Vessel shore reporting

The purpose of this MS is to:

- facilitate a fully digital exchange system in accordance with the needs defined by the actors;

- secure submission and exchange of information by electronic means required by shore-based authorities in the harmonized standard and in the required time frame;

- reduce the administrative burden on the crew and ashore;

- reduce the number of human errors and missing information by automating the reporting processes as much as possible; and

- provide real-time access to information to relevant stakeholders in a secure manner, including the use of authentication.

The purpose of this MS is also to:

- enhance safety and security in ship reporting system areas by utilizing existing modern technology and digital information, taking cyber risk management into account;

- make use of existing modern technology to reduce the administrative burden and reduce human errors; and

- enhance shore capacity for efficient, optimized and environmentally friendly traffic organization.

8.5 Operational approach

Future ship-to-shore reporting

Electronic systems for ship-to-shore reporting should use the same protocols and product specifications, in a single window solution, to send digital pre-arrival information such as the FAL-related declarations and other regional/national requirements. This will ensure a common harmonized platform for all ship reporting systems.

National competent authorities should provide information about reporting formalities and ensure that all information regarding reporting is easy to understand, accessible and even automated for the master or operator.

This service should provide appropriate ICT tools for shipboard and shore-based personnel to streamline the processes and procedures associated with the generation and distribution of required reports, including retrieval of information from other ship systems (ballast management, waste management system, emission control system, navigation system, etc.) and from shore-based sources (cargo and passenger booking offices, crewing agents, stevedores, etc.).

Examples of information to provide can be:

Information related to:	Examples
Reporting regulations	• what to report. The pre-arrival information may consist of ship particulars, arrival notice, crew and passenger lists, crew and passenger effects declarations, stores list, HAZMAT information, waste declaration, ship's certificates, seafarers' certificates (both as e-certificates), ports of call list, dangerous cargo declaration, ISPS and manifests, vaccination list, narcotic list, ship's money declaration, etc.; • when/what to report (e.g. 24h, 48h, 72h, 96h before arrival); and • to whom (e.g. immigration, police, harbour master).
Reporting tools	• security, authenticity, integrity and confidentiality solutions • Web, app, etc. • interfaces and endpoints • secure access to digital data repositories (e.g. e-Certificate repository MyCert) • communication • guidelines and rules
Shore receivers and support	• contact information • support information • information about local reporting aid/support such as coastal radio stations and agencies

The type of information required and reporting periods may differ from country to country and create some confusion on the ships' side if the information requested is not clearly stated. Also, the reporting periods in some situations start as far in advance as 96 hours before a ship enters a coastal administration's waters. This may pose challenges with respect to the communication means available to provide the required information all along the voyage.

In order to achieve the operational goal for future ship-to-shore reporting, the ship should be able to make use of a complete set of product specifications that ensure a simple and harmonized system for providing reporting information.

Without such a global maritime single window environment (GMSWe), new systems may be introduced that do not interoperate with one another. The consequence will be that the administrative burden on board is not reduced and is instead increased through the added complexity of more interfaces to deal with.

The following non-exhaustive list of notifications should be provided through a GMSWe:

- port arrival notification (location, timing, purpose etc.) including the Arrival notification to the Defence system

- port (arrival) departure notification for ships carrying dangerous or polluting cargo

- notifications of bunkers on board

- notifications of NOx information

- notifications of landing of waste

- notifications of Pilot Exemption Certificate (PEC) voyage

- notifications of intent to cross the national baseline

- maritime security notifications

- Port State control notifications

- customs declarations (in accordance with the FAL Convention)

- border control notifications

- immigration and health declaration

- terminal berth booking request at port

- pilot booking request

When considering new product specifications regarding ship-to-shore reporting, the IMO Compendium should be consulted to see if a data set is already produced and can be used for the product specification.

Future ship reporting system in conjunction with a ship reporting system

As the scope, transmission capacity and data format of each of these systems differ, the possibility of developing standardized protocols with their product specifications to automate the collection of data on board and communicate it to shore-based authorities might constitute a real issue. There is a possibility of packaging the reporting information with a route exchange format (e.g. S-421), but the security of the means of communication would need to be carefully evaluated. The same is true for the new Port Call Message Standard (S-211) as a complementary data stream integrable with S-421.

Some of these reporting systems are not using a digital format, which prevents the provision of an automated service. The first step in an operational approach would be the use of a communication system capable of transmitting digital data. Secondly, and given reporting requirements differ among coastal States, a library containing information required by each administration should be developed, which complies with the standardized product specifications principle.

To avoid duplication, overlap and unnecessary administrative work, information should be exchanged between ship reporting systems in the same region and with a relevant ship-to-shore reporting system.

This can be achieved once the product specification and digitalization of all elements required is done. The product specification should be based on the IMO data set on ship reporting systems included in the IMO Compendium.

The data that comprises the ship reports are typically either of a fixed, dynamic or voyage-related character. Fixed information, such as the ship name, call sign, IMO number, country codes, certificates and contact information, should be stored as basic information in a database and retrieved upon request. Thus, the fixed data is registered only once. Dynamic information such as the ship position, heading, and speed, can be automatically collected from the ship's positioning- and/or AIS systems, and should not have to be manually registered. Lastly, the voyage-related information, such as port of departure and arrival, cargo, and crew/passengers, will possibly, in the near future, have to be manually maintained. However, the voyage-related information could in many cases be extracted from internal or external databases, further optimizing the automation process on board the ship.

Combining the fixed, dynamic or voyage-related information in a dynamic, secure and automated reporting service will result in a major reduction of the workload for the crew when it comes to reporting.
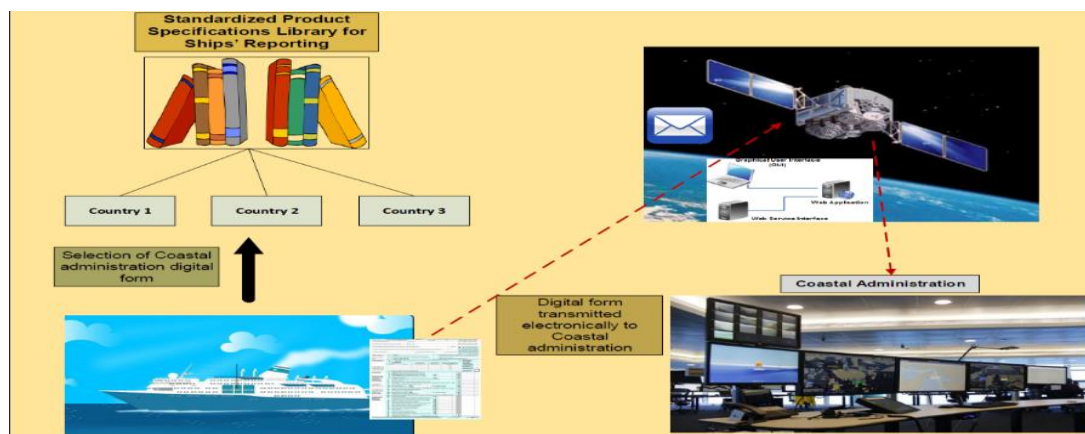

Figure 8-4: Example of electronic communication systems

8.6   User needs

Ships' masters are facing a considerable administrative burden to comply with different vessel shore reporting requirements and transmission of information. Different procedures, data formats, documentary requirements and formalities are applied depending on the country, ship reporting system or port of destination. One of the main challenges is that the ship has to communicate in different manners through different systems.

This, in turn, requires building and maintaining a library of required reports that are uniquely identified and characterized by their requirements for format, deadline, content, etc. The ship reporting system also requires developing and maintaining an S-100 product specification for IMO Common Maritime Data Structure (CMDS) that can be used to generate all required reports in the library. Lastly, it requires that ships' systems that generate reporting information be certified to be compliant with an international machine-to-machine interface standard or ship network standards such as IEC 61162 series.

Several advantages of digitalized ship reporting have been identified:

- one single window for ship reporting makes it easier for shipping to send mandatory information to authorities;

- the number of notifications is reduced as various authorities receive one common notification instead of many singular notifications from individual vessels;

- it reduces administrative burdens on board, which enables seafarers to spend more time on navigational tasks;

- already registered users can reuse data previously registered in the system, reducing administrative time;

- the system is designed so that it becomes easier for shipping to meet reporting obligations;

- the transition to digital and consistent messages from shipping to ports facilitates more efficient port logistics;

- quick and easy access to digitized and automated ship notifications frees up time and resources in the government administration;

- easy access to important information needed in emergency situations; and

- transparency and reuse of information among stakeholders increase efficiency between the transport modes.

Ship reporting system

In ship reporting system areas, shore authorities can provide more automated and efficient reporting systems by using technology such as AIS and VDES, in combination with common data structures and product specifications.

Figure 8-5: BAREP SRS between the Russian Federation and Norway

8.7   Information to be provided

Ship-to-shore reporting

Several initiatives related to ship-to-shore reporting are ongoing. The largest is probably the work regarding the establishment of a European maritime single window environment (EMSWe). Standards for approximately 1,200 required reporting elements will be the basis for a 100% digital solution. The data set of the EMSWe is aligned with the IMO Compendium which by FAL 46 has already more than 400 data elements and is incrementally growing.

Once this specification is done, the exchange and reuse of information can be realized. The reporting party does not need to relate to all the elements, but the system has the capacity to exchange and reuse the various data elements.

IMO-adopted ship reporting systems

The currently 23 IMO-adopted ship reporting systems follow the structure based on resolution A.851(20), as amended by resolution MEPC.138(53).

Parts of the required information, such as ID, course, speed, and position, are normally captured by sensors such as AIS and LRIT. Remaining information is often already available from ship-to-shore reporting. The sharing of information between systems will have several benefits.

The IMO data set on ship reporting systems (resolution A.851(20)) is available in the IMO Compendium on Facilitation and Electronic Business and should be used when developing electronic services.

Ship-to-shore reporting and maritime single window

Ship-to-shore reporting is a generic term and a supporting reporting system to receive information from the ships could, in principle, be any system suitable for the purpose. However, some kind of single window system is often the case.

The term "maritime single window" (MSW) can be defined as a one-stop service environment that covers maritime and port administrative procedures, such as port entry/departure declaration, notice of security reports, and other related information between private sectors and public authorities nationwide. In other words, an MSW is a single window in the scope of maritime and port fields.

The system depicted on the right represents a conceptual architectural model that defines the structure and behaviour of the MSW. This model assumes that a single authority centralized information mode (CIM) has the responsibility to operate the system that receives information electronically via the single window and thereby disseminates this information to all relevant stakeholders.

The conceptual model illustrates that the MSW consists of an environment whereby ship data providers can submit information electronically either through a user interface or a system-to-system interface. The information is digitized, and the individual data elements will be submitted once only.

Further information is available in the IMO *Guidelines for setting up a maritime single window*. In addition, a GISIS module collects information on existing MSW systems in Member States.
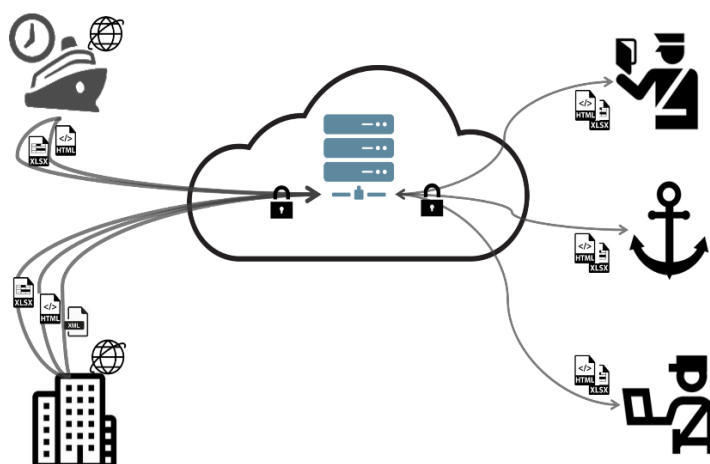

Figure 8-6: MSW conceptual architectural model

8.8   Associated technical services

To be capable of generating this information automatically and transmitting it automatically, a realistic operational implementation of ship-to-shore reporting and ship reporting systems would require the involvement of both competent authorities and ship operators.

The concept of an automatic reporting schema comprises in principle two technical systems or services:

- onboard system (ship side); and

- onshore system(s) (shoreside).

The principal figure below visualizes the scope of the reporting and shows how the two systems or services interact at various stages of a ship voyage.

The reporting obligations usually lie with the master on the ship, but the actual reporting might be done by a third party such as a ship agent. For simplicity, the third party is left out of the figure. Using existing data communication systems, ship information will be transmitted to the authorities, ports, VTSs and shore centres during the ship voyage or ship arrival in-port.

The authorities' (shore) side, illustrated in the figure on the right, is included to visualize the holistic picture of ship reporting. The authorities will receive relevant information from the reporting ship, using the existing connections and exchange mechanisms implemented in the relevant system, i.e. NSW(s).

The main area of interest is depicted in the grey area of the figure. This represents the area where automatic ship reporting typically operates, and where the systems interact and communicate with or affect each other. The endpoints typically make visible one or more services that enable submission, retrieval and exchange of information.

The endpoints indicated in the figure comprise at least two principal sets of services that are common in both ship-to-shore reporting and ship reporting system reporting; one that enables the ship and shore to request and receive information, and another service that enables the transmission and reception of the reporting information.
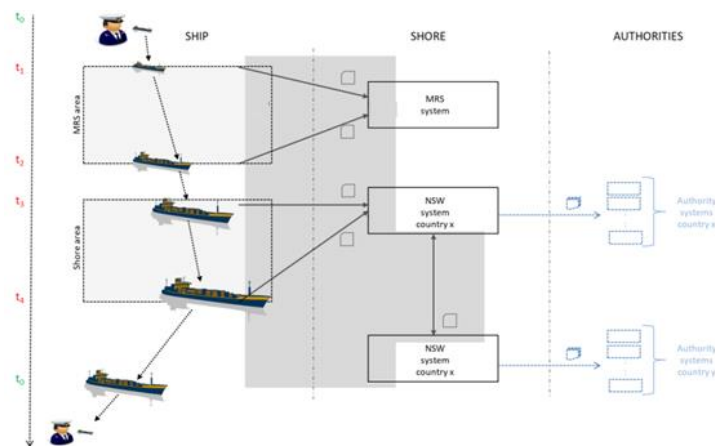

Figure 8-7: Ship reporting during voyage

Request and respond services

Various reporting systems have different reporting obligations and procedures. The reporting obligations (information element to be reported) should be in accordance with resolution A.851(20), as amended by resolution MEPC.138(53), the FAL Convention or other regional/national requirements. However, not all reporting systems require all the information that is specified in the resolution and the reporting procedures will vary based upon different parameters.

One of the central services that should be found in request and respond services (RRS) is the ability of the ship's system to request the reporting obligations for a particular voyage or port call. Based on, for example, the ship particulars and voyage information, such as type and size of the ship, port of departure, crew and passengers, the ship system should have the opportunity to request the shore-based reporting system for the reporting obligation for that particular ship voyage. The shore-based system should in return respond to the requester in a structured message of the obligatory reporting information and reporting procedures that would be required for the ship and voyage.

Therefore, seen from the ship perspective, the ship-to-shore reporting and ship reporting system makes visible an information service and is able to digitally respond to information requests from ships. Both types of shore services should as a minimum respond by giving the requesting system the accurate current reporting obligation for that particular reporting system, in both cases ship-to-shore reporting or ship reporting system.

Additional functions in the service could give responses to other requests as indicated earlier in this document.

Transmit and receive services

Transmit and receive services (TRS) would work in a similar manner as to the RRS service, thus the ship-to-shore reporting and ship reporting system should be able to consume and acknowledge the submitted reports (new or updates) from the ships.

The information that is exchanged between ship and shore will result in series of digital messages between the two parties. This is often elaborated and depicted in a particular notion and is dealt with in section 8.9 Message exchange.

8.9 Message exchange

In every reporting scheme and, in particular automatic reporting schema, there need to be well defined message exchange mechanisms in place. These exchange mechanisms should in principle be independent of the context in which the exchange is taking place.

The exchange is often described as message exchange sequences (patterns) and corresponding information elements that are necessary to execute the exchange. Each pattern can represent several different concrete exchanges between different parties. However, when it comes to ship reporting, the message sequences should be the same generic flow of information both for single window data exchanges or ship reporting to VTS or any other ship reporting system.
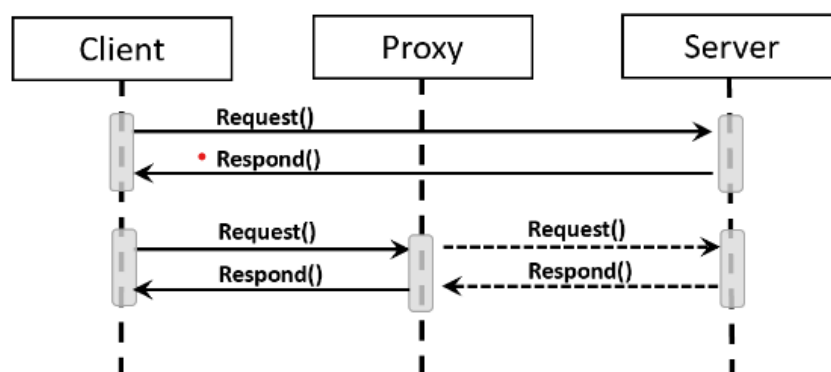
Figure 8-8: Client-Server sequence diagram

The sequence diagram(s) presented in this document consists of vertical lines representing an abstract time axis for respectively client (ship) and server (shore), and in some cases a proxy (catalogue). Arrows between the parties represent the sequence of messages that need to be exchanged. A thick line from an arrow end to a new arrow start shows synchronous processing by the respective party.

The e-navigation services message flow and representation are being discussed in the IMO Expert Group on Data Harmonization (EGDH), is a slightly modified version of the figure found in annex 3 to IMO document EGDH 1/9.[8] The modification to the original generic drawing is done to visualize a specific sequence diagram for the pattern which describes a service request in relation to the concept of automatic reporting.

In figure 8-9: Request reporting, the ship requests the RRS from the shore centre; in this case the requests are for the *Reporting obligations and procedures* for clearance to go to port or entry to a ship reporting system area. A receipt is sent to acknowledge that the request for service is received by the shore centre. The shore centre proceeds with some work to handle the request and will respond to the requesting ship with the relevant reporting requirements and procedures for the particular ship and voyage. In the generic sequence diagram, there are also sequences for loops and options related to the message exchange. Loops and options might not be relevant in the example.

In the example above a catalogue service (proxy service) could make the service visible on behalf of the shore centre.

In a sequence where the ship actually submits a report (TRS service), loops and options would be very relevant. As an example, a single window system that has received a ship report would check that the data received is correct and in the right format. The single window will then forward the relevant information to the correct authorities. Results of the work done by the shore centre are sent to the ship as a service response, for instance, by a single window; this can be a clearance to enter the port. The ship can both update and cancel the request in several iterations. For port clearance, this corresponds to sending a clearance message multiple times, when the ship has available more information to submit. The ship can also cancel the service request, for instance cancel the port clearance request.
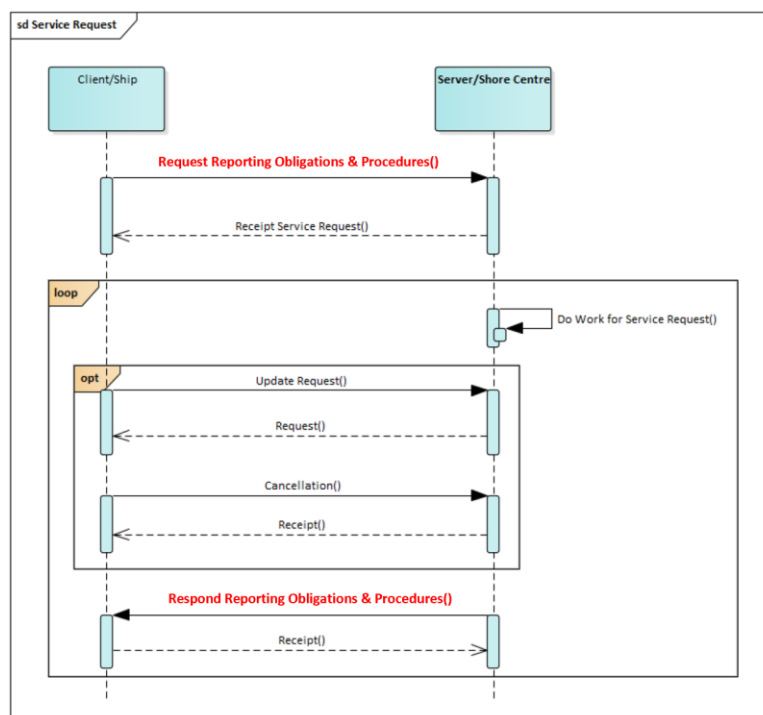

Figure 8-9: Request reporting obligations and procedures

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[8]   ISO (2019), input paper to IMO EGDH 1/9, submitted by ISO: "IMO DATA SET RELATED TO ACKNOWLEDGEMENT RECEIPTS", 4 October 2019.

To enable a sequence of data exchange similar to what is described in the examples above would require definitions of additional data elements (beyond conventions and regulations). The data elements would be within the computer and communication domain and will not require additional human interactions or administrative burdens.

The pattern can also be used to describe a use case where the client subscribes to updates from server until some time-out or until cancellation.

Note that for simplicity and consistency, the sequence diagram is foreseen to be an information exchange between the ship and shore. However, from a practical and real-world point of view, systems and services "on board" might be implemented elsewhere i.e. onshore or in some kind of cloud implementation. These sequence diagrams should be interpreted with these facts in mind.

Standards and harmonized data

The harmonization of data should be based upon the new revision of the IMO Compendium, which supports the transmission, receipt and response of information required for the arrival, stay and departure of the ship, persons and cargo via electronic data exchange.

The IMO Compendium constructs the IMO Data Set, which identifies and defines all of the data elements related to reporting information requirements and the IMO Reference Data Model to establish the underlying hierarchical data structure used in electronic data exchange.

The IMO Data Set combined with the IMO Reference Data Model promotes harmonization among the relevant international standards used for electronic business from the World Customs Organization (WCO), the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), the International Organization for Standardization (ISO), and other organizations.

8.10   Relation to other Maritime Services

Digital information from the ship reporting system using common standards is beneficial for several stakeholders and actors involved.

In addition to authorities (e.g. border police, immigration, defence, coastguard, customs) requesting the information, the list below gives examples of services that can benefit from access to ship reporting information.

Maritime Service	Examples of information related to MS 8
MS 1 – Vessel traffic service	Type of vessel, nationality, MMSI, IMO number, contact information, draught, cargo
MS 4 – Port support service	The majority of the information in a ship reporting system is useful and can be reused for an effective and transparent port operation
MS 5 – Maritime safety information service	Provides information on changes to reporting requirements
MS 6 – Pilotage service	Ship reporting systems can exchange information with the pilot system. Easy access to information can be important for the pilot. A digital pilot requesting/booking system connected to the ship reporting system will increase efficiency.

Maritime Service	Examples of information related to MS 8
MS 10 – Maritime assistance service	Information about cargo, dangerous goods and persons on board can reduce time before assistance and contribute to the allocation of the appropriate resources for the actual situation
MS 11 – Nautical chart service	Contains charted information about areas where reporting is required
MS 12 – Nautical publications service	Contains detailed information about reporting requirements, such as who must report, when reports are due, and to whom the reports must be submitted
MS 13 – Ice navigation service	Information from the ship reporting system can contribute to a more tailor-made and effective icebreaker service
MS 16 – Search and rescue service	Salvage information, drifting patterns, SAR areas, rescue capabilities in the area

APPENDIX TO MS 8

SRS - SHIP REPORTING SYSTEMS PRODUCT SPECIFICATIONS

DESIGNATOR	FUNCTION	INFORMATION REQUIRED	DETAILED REPORTING REQUIRMENTS	TYPE	S-100 REFERENCE
SP	Sailing plan	Before or as near as possible to the time of departure from a port within a system or when entering the area covered by a system.	The ship shall transmit the sailing plan (SP) on entry into the ship reporting system area by crossing the reporting line.	DIGITAL	S-127 (not report content), S-212, S-421. S-212 makes reference to a S-421 data set.
PR	Position report	When necessary to ensure effective operation of the system.	The ship shall transmit the position report (PR) on passing the reporting points.	DIGITAL	S-127 (not report content); categoryOfShipReport
DR	Deviation report	When the ship's position varies significantly from the position that would have been predicted from previous reports, when changing the reported route, or as decided by the master.		DIGITAL	S-127 (not report content); categoryOfShipReport
FR	Final report	On arrival at destination and when leaving the area covered by a system.	The ship shall transmit the final report (FR) when finally exiting from the ship reporting system area by crossing the reporting line.	DIGITAL	S-127 (not report content); categoryOfShipReport

DESIGNATOR	FUNCTION	INFORMATION REQUIRED	DETAILED REPORTING REQUIRMENTS	TYPE	S-100 REFERENCE
DG	Dangerous good report	When an incident takes place involving the loss or likely loss overboard of packaged dangerous goods, including those in freight containers, portable tanks, road and rail vehicles and shipborne barges, into the sea.	Primary reports should contain items A, B, C (or D), M, Q, R, S, T, U, X of the standard reporting format; details for R should be as follows: *(See details reporting requirement in R)*	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.
			If the condition of the ship is such that there is a danger of further loss of packaged dangerous goods into the sea, items P and Q of the standard reporting format should be reported; details for P should be as follows: *(See details reporting requirement in P)*	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.
			Particulars not immediately available should be inserted in a supplementary message or messages.	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.

DESIGNATOR	FUNCTION	INFORMATION REQUIRED	DETAILED REPORTING REQUIRMENTS	TYPE	S-100 REFERENCE
HS	Harmful substances report	When an incident takes place involving the discharge or probable discharge of oil (Annex I of MARPOL 73/78) or noxious liquid substances in bulk (Annex II of MARPOL 73/78).	In the case of actual discharge primary HS reports should contain items A, B, C (or D), E, F, L, M, N, Q, R, S, T, U, X of the standard reporting format. In the case of probable discharge (see 3.4), item P should also be included. Details for P, Q, R, T and X should be as follows: *(See details reporting requirement in P, Q, R, T and X)*	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.
			After the transmission of the information referred to above in the initial report, as much as possible of the information essential for the protection of the marine environment as is appropriate to the incident should be reported in a supplementary report as soon as possible. That information should include items P, Q, R, S and X. *(See details reporting requirement in P, Q, R, T and X)*	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.
			The master of any ship engaged in or requested to engage in an operation to render assistance or undertake salvage should report, as far as practicable, items A, B, C (or D), E, F, L, M, N, P, Q, R, S, T, U, X of the standard reporting format. The master should also keep the coastal State informed of developments.	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.

DESIGNATOR	FUNCTION	INFORMATION REQUIRED	DETAILED REPORTING REQUIRMENTS	TYPE	S-100 REFERENCE
MP	Marine pollutants report	In the case of loss or likely loss overboard of harmful substances in packaged form including those in freight containers, portable tanks, road and rail vehicles and shipborne barges, identified in the International Maritime Dangerous Goods Code as marine pollutants (Annex III of MARPOL 73/78).	In the case of actual discharge, primary MP reports should contain items A, B, C (or D), M, Q, R, S, T, U, X of the standard reporting format. In the case of probable discharge (see 3.4), item P should also be included. Details for P, Q, R, T and X should be as follows: *(See details reporting requirement in P, Q, R, T and X)*	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.
			After the transmission of the information referred to above in the initial report, as much as possible of the information essential for the protection of the marine environment as is appropriate to the incident should be reported. That information should include items P, Q, R, S and X. *(See details reporting requirement in P, Q, R, S and X)*	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.
			The master of any ship engaged in or requested to engage in an operation to render assistance or undertake salvage should report, as far as practicable, items A, B, C (or D), M, P, Q, R, S, T, U, X of the standard reporting format. The master should also keep the coastal State informed of developments.	DIGITAL	S-127 (not report content); categoryOfShipReport, S-212; ShipInformation with cargoInformation.

DESIGNATOR	FUNCTION	INFORMATION REQUIRED	DETAILED REPORTING REQUIRMENTS	TYPE	S-100 REFERENCE
PROBDIS	Probability of discharge	The probability of a discharge resulting from damage to the ship or its equipment is a reason for making a report. In judging whether there is such a probability and whether the report should be made, the following factors, among others, should be taken into account:	The nature of the damage, failure or breakdown of the ship, machinery or equipment; and	DIGITAL	S-212; BroadcastAccident;accidentShipInformation;accidentShipCargoInformation
			Sea and wind state and also traffic density in the area at the time and place of the incident.	DIGITAL	S-212; BroadcastAccident;accidentShipInformation;accidentShipCargoInformation
		It is recognized that it would be impracticable to lay down precise definitions of all types of incidents involving probable discharge which would warrant an obligation to report. Nevertheless, as a general guideline the master of the ship should make reports in cases of:	Damage, failure or breakdown which affects the safety of ships; examples of such incidents are collision, grounding, fire, explosion, structural failure, flooding, cargo shifting; and	DIGITAL	S-212; BroadcastAccident;accidentShipInformation;accidentShipCargoInformation
			Failure or breakdown of machinery or equipment which results in impairment of the safety of navigation; examples of such incidents are failure or breakdown of steering gear, propulsion plant, electrical generating system, essential shipborne navigational aids.	DIGITAL	S-212; BroadcastAccident;accidentShipInformation;accidentShipCargoInformation

DESIGNATOR	FUNCTION	INFORMATION REQUIRED	DETAILED REPORTING REQUIRMENTS	TYPE	S-100 REFERENCE
LANG	Language	Where language difficulties may exist, the languages used should include English, using where possible the Standard Marine Navigational Vocabulary. Alternatively, the International Code of Signals may be used to send detailed information. When the International Code is used, the appropriate indicator should be inserted in the text, after the alphabetical index.		DIGITAL	most S-100 based product specifications have a complex attribute with language attribute using the ISO639-3 code list
REFCHART	Reference chart	Indicate the reference chart	Chart datum is World Geodetic System 1984 (WGS 84) datum	DIGITAL	??
GIVE IN FULL	Any other report	Any other report should be made in accordance with the system procedures as notified in accordance with paragraph 9 of the General Principles. (See details reporting requirement in resolution A.851(20))	All VHF, telephone, radar, AIS and other relevant information will be recorded and the records stored for 30 days.	DIGITAL	S-127, possibly S-212

MS 9 – Telemedical assistance service

9.1   Submitting organization

IMHA

9.2   Coordinating bodies

IMO and IMHA

9.3   Description of the Maritime Service

According to IMO/ILO resolution 164, the TMAS provider should be able to provide medical advice for seafarers 24h/day, 365 days/year. TMAS should be permanently staffed by physicians qualified in conducting remote consultations and who are well-versed in the particular nature of treatment on board ship.

Within maritime medicine, the prevailing view has been, for a long time, that a standardization of the TMAS services is both necessary and wanted. This would enhance the quality of the medical practice. A standardization of reporting and registering of medical events will also make a much better basis for advancement (MSC.1/Circ.1218 on *Guidance on exchange of medical information between telemedical assistance services (TMAS) involved in international SAR operations* and MSC/Circ.960 on *Medical assistance at sea*).

9.4   Purpose

TMAS can be delivered in all sea areas, but differences in bandwidth, depending on available types of transmission techniques, will result in different levels of service.

Seafarers have some basic and limited training and skills in medical treatment. Sharing of digital information for diagnosis will increase the rate of appropriate treatment.

It is essential to provide seafarers with easy and fast access to a single point of contact with the TMAS centre, as well as to share the information between the TMAS centre and medically responsible personnel on board during treatment.

The purpose of TMAS is to give decision support and advice to the seafarer on board responsible for medical care whenever the provision of treatment cannot wait. This is today mostly done by voice communication using VHF, MF or short-wave radio, or email. In a future e-navigation scenario, the quality of remote diagnostics and even treatment can be expected to improve.

In addition to prevailing TMAS provisions, real-time monitoring of the patient's current health status will be important. The parameters monitored may differ in different systems, but may include heart rate, blood oxygen saturation and pressure. As an example, see the figure below:

Figure 9-1: Example of a typical telemetry screen

Further needs might involve real-time video chat between the remote specialist doctor and the patient, as well as examinations with remotely controlled cameras. In addition, extensive, detailed cardiovascular (heart) data for a period of time should be able to be collected and sent as compressed files for further monitoring by the specialist doctor.

9.5 Operational approach

It could be envisioned that, in the not-too-distant future, what today is very expensive medical equipment could be installed on some types of ships, e.g. large cruise vessels. Examples of such equipment could be ultrasonography, computer tomography (CT) and surgical operation robots. Such equipment will then be remotely operated from land given reliable radio connections.

Diagnostic ultrasonography is used to see internal body structures such as tendons, muscles, joints, vessels and internal organs. Its aim is often to find a source of a disease or to exclude any pathology. The practice of examining pregnant women using ultrasound is called obstetric ultrasound, and is widely used.

The European Space Agency has already tested a long-distance robotic ultrasound system for remote operation by distant specialists. An assistant on board simply holds the device against the patient and the ultrasound expert can move the probe as if present in the examination room, rather than thousands of kilometres away. They control the device in real time using a joystick, based on ultrasound imagery relayed back.

Computed tomography, more commonly known as a CT or CAT scan, is a diagnostic medical test that, like traditional X-rays, produces multiple images or pictures of the inside of the body.

Remote surgery (also known as telesurgery) allows the surgeon to remotely perform surgery either using a direct telemanipulator or through computer control. The surgeon does not have to be present, but can be anywhere in the world, leading to the possibility for remote surgery.

9.6   User needs

Today

A digital health emergency monitoring system allowing logged text interchange between a ship and medical specialist at a shore hospital including:

- voice communication not only with the medical officer on board, but also with the patient in the medical bay;

- real-time video for visual examination by the remote specialists using video;

- real-time transmission at length of medical telemetry;

- transmission of compressed data packages of e.g. EEG data; and

- up-to-date digital georeferenced lists of available telemedical assistance services that can be offered by a coastal state. Comparison of TMAS with ship capabilities would facilitate the request of the most adapted service to respond to the situation on board.

In the future (examples):

- transmission of data and remote control of ultrasonography;

- transmission of data and remote control of computer tomography and the like imaging techniques; and

- transmission of data and remote control of robotic surgery.

9.7   Information to be provided

(Under development)

9.8   Associated technical services

(Under development)

9.9   Relation to other Maritime Services

Maritime Service	Examples of information related to MS 9
MS 1 – Vessel traffic service	Communication with ship
MS 12 – Nautical publications service	Provide up-to-date information on radio station and earth stations offering TMAS
MS 16 – Search and rescue service	Medical information and constraints for SAR procedures

MS 10 – Maritime assistance service

10.1   Submitting organization

Norway

10.2   Coordinating bodies

IMO and Norway

10.3   Description of the Maritime Service

The most common events requiring MAS are:

- fire

- explosion

- damage to the ship, including mechanical and/or structural failure

- collision

- pollution

- impaired vessel stability

- grounding

Resolution A.950(23) on *Maritime assistance services (MAS)* specifies that the circumstances of a ship's operation that involve MAS are not those requiring the rescue of persons. Three situations can arise:

- the ship is involved in an incident (e.g. loss of cargo, accidental discharge of oil) that does not impair its seakeeping ability but nevertheless has to be reported;

- the ship, according to its master's assessment, is in need of assistance but is not in a distress situation (about to sink, fire developing, etc.) that requires the rescue of those on board; and

- the ship is found to be in a distress situation and those on board have already been rescued, with the possible exception of those who have remained aboard or have been placed on board to attempt to deal with the ship's situation.

However, if in an evolving situation, the persons on board find themselves in distress, the involvement of MRCC will have priority over MAS. Accordingly, MAS is responsible only for receiving and transmitting communications and monitoring the situation.

Development of scenarios including their potential consequences with regard to the safety of persons and pollution, fire, toxic and explosion risks.

10.4   Purpose

The purpose of this MS is to manage communications between the coastal State and the master requiring assistance.

As an intermediary, the main purposes of the MAS are:

- receiving the reports, consultations and notifications required by the IMO instruments referred to in annex 1 of resolution A.950(23) in the event of an incident involving a ship;

- monitoring the ship situation if a report, as referred above, discloses an incident that may cause the ship to be in need of assistance;

- serving as the point of contact between the master and the coastal State concerned, if the ship's situation requires exchanges of information between the ship and the coastal State but is not a distress situation that could lead to a search and rescue operation; and

- serving as the point of contact between those involved in a marine salvage operation undertaken by private facilities at the request of parties having a legitimate interest in the ship and the coastal State, if the coastal State concerned decides that it should monitor all phases of the operation.

10.5   Operational approach

The establishment of MAS should not necessarily entail the set-up of a new organization. The functions of MAS could, at the discretion of the Administration, be discharged by an existing organization, preferably MRCC, or alternatively a harbour master's office, a coastguard operations centre (if one exists) or another body.

Coastal States are requested to notify IMO of the existence and details (call numbers, call signs, etc.) of their MAS, in accordance with the predetermined format (resolution A.950(23), annex 2, appendix).

MAS should be operational on a 24-hour basis and it should be possible for the English language to be used in exchanges between a ship in need of assistance and MAS. Also, MAS should be authorized by their respective Governments to exchange with each other information concerning reports received and situations involving ships which may be in need of assistance.

Information on MAS is updated in the Global Integrated Shipping Information System.

The development of a database containing the key services' contact information and availability of their respective resources would help move towards the digitalization of MAS.

Also, the use of templates listing the types of incidents that commonly occur and their level of severity could facilitate ship-to-shore-based communication. The exchange of information on key services, their contact details, capabilities and geographical service areas could be developed as an S-100 based product specification. On the ship side, digital nautical publications in the S-12x series of product specifications, such as S-123 (Marine Radio Service), could contain MAS information.

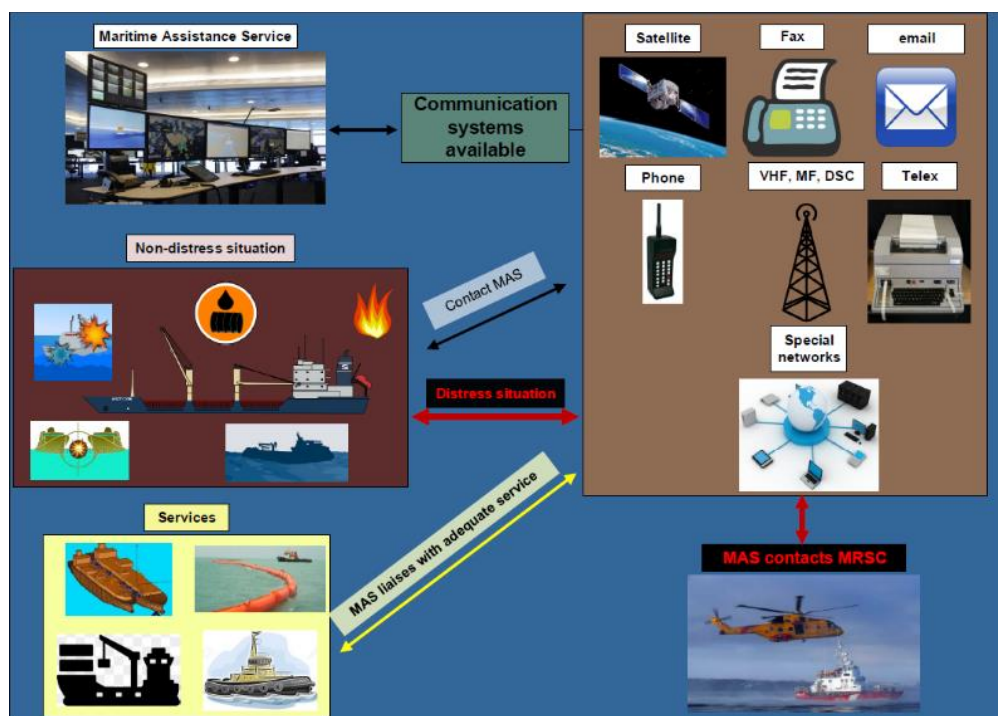The figure below illustrates briefly the different MAS functions:

Figure 10-1: Illustration of some functions provided by MAS

10.6 User needs

In the future, this MS aims to facilitate access to all necessary MAS information required by ships in distress, in order to provide user-friendly and understandable information by using modern technology and common standards.

Effective communications and exchange of information between relevant stakeholders would contribute to efficient and time-reducing MAS operations. Electronic exchange of information would significantly contribute to the improvement of this service. For example, notifying a ship master in distress or in the area necessary of information accordingly.

Information from several sensor and information systems can be easily accessible when common standards and product specifications are developed and harmonized. Information from ship reporting/single window environment systems will contribute with crucial up-to-date information of necessary quality.

Increased connectivity, through sharing of harmonized digital information regarding MAS operations, will reduce human factor errors, such as language barriers or outdated information in publications, enhancing efficiency and access to information in a fast and easy-to-use manner.

In some of these situations, the ship's assistance may require the designation of a place of refuge in order to limit the navigational impacts, protect the environment or facilitate repairing the ship. In that case, an assessment of risks related to the identified event should take into account:

.1   environmental and social factors, such as:

.1   safety of those on board;

.2   threat to public safety;

.3   pollution caused by the ship;

.4   sensitive habitats and species; and

.5   facilities available; and

.2   natural conditions, such as:

.1   prevailing winds and sea conditions;

.2   tides and tidal currents; and

.3   bathymetry.

10.7   Information to be provided

Information related to:	Examples
General information	- Competent MAS - Roles and responsibilities of authorities and responders (fire-fighting capability) - Responsible SAR coordination centre - Contact information to MRCC/operator - Ongoing operations in an area
MAS information	- MAS geographical coordinates, contact information, capacity, etc. - Information on available resources for lightering - Information on available resources for pollution combating and recovery - Information on available resources for towage - Information on available resources for stowage - Information on available resources for salvage - Information on available resources for storage - Contingency planning - Evacuation facilities - Type of operation - What and when - Vessels involved - Communication

Table 10-1: Examples of types of information provision that MAS can cover

10.8   Associated technical services

The *Guidance on minimum communication needs of maritime rescue coordination centres (MRCCs)* (COMSAR/Circ.37/Rev.1) is recommended as a basis. This circular identifies the following communication systems, such as:

- telephone links;

- fax links;

- telex link;

- VHF and MF with DSC;

- ordinary VHF;

- COSPAS-SARSAT;

- special networks – examine the possibility of linking with existing networks (Administration, armed forces telephone networks), in particular the aeronautical fixed telecommunication network (AFTN), which provides a link with the aeronautical rescue organization; and

- S-123 (Marine radio service) data products contain contact details for MRCCs.

(To be further developed)

10.9   Relation to other Maritime Services

Maritime Service	Examples of information related to MS 10
MS 1 – Vessel traffic service	Local sensor information such as CCTV, Radar, AIS. Regulations, other traffic
MS 4 – Port support service	Port availability and anchorage are in the port, services related to the MAS situation
MS 5 – Maritime safety information service	All information depending on the structure of MSI
MS 6 – Pilotage service	Contact information for pilotage, pilot assistance, pilot request
MS 7 – Tug service	Tug capacity, contact information, tug order and updates
MS 8 – Vessel shore reporting	Information about the reporting formalities, local regulations, contact information, notification about dangerous cargo, number of persons on board, arrival and departure information etc.
MS 9 – Telemedical assistance service	Contact information
MS 11 – Nautical chart service	Local area updates, chart updates, Notice to mariners
MS 12 – Nautical publications service	Tidal tables, notice to mariners, list of lights, information updates to publications. Contact information.
MS 13 – Ice navigation service	Ice routes, ice conditions, ice-breaking assistance

Maritime Service	Examples of information related to MS 10
MS 14 – Meteorological information service	Weather information, visibility, wave information.
MS 15 – Real-time hydrographic and environmental information services	Horizontal and vertical tidal information in an area, real-time current, real-time wave form sensors in an area
MS 16 – Search and rescue service	Search and rescue contact information, SAR capacity. SAR areas of operations.

MS 11 – Nautical chart service

11.1   Submitting organization

IHO

11.2   Coordinating bodies

IMO and IHO

11.3   Description of the Maritime Service

This Maritime Service provides geospatial information (in digital and/or printed format) to support safe maritime navigation. The types of information depicted in nautical charts include the configuration of the shoreline and sea floor, water depths, locations of dangers to navigation, locations and characteristics of aids to navigation, anchorages, and other features relevant to maritime navigation. SOLAS regulation V/2.2 defines a nautical chart or nautical publication as "*a special-purpose map or book, or a specially compiled database from which such a map or book is derived, that is issued officially by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution and is designed to meet the requirements of marine navigation*".

A nautical chart service should include updated functions to ensure that all navigational products and service are kept current. Update information should be delivered in a standardized format. Distribution networks should conform to standardized data authentication and distribution standards to ensure their safe and secure transmission and delivery.

11.4   Purpose

The primary purpose of this Maritime Service is to provide information to be used for safe navigation. The information provided as part of a nautical chart service must complement the information provided as part of other services such as nautical publications services and real-time hydrographic and environmental information services. A nautical chart service should support functions such as voyage planning, pilotage, collision avoidance, vessel traffic management, etc.

A nautical chart service should include discovery metadata information that will enable users to determine what products and services are available within a given area of interest (both geographic and contextual).

11.5   Operational approach

The data model is based on the IHO S-100 Hydrographic data model and derived product specifications. It enables information provision in a harmonized way. The products should take into account a harmonized display of navigational information. The portrayal of digital nautical chart services should conform to IMO/IHO standards.

The provision of Nautical chart services should use distribution strategies, methods, and technologies which can adapt to serve vessels in locations or conditions that may be challenging for data transfer.

Digital chart distribution services should conform to the S-100 authentication and encryption data standard. Mechanisms should also be included to accommodate new editions of the chart product specification, including the issuing of new data sets, and associated feature and portrayal catalogues.

11.6 User needs

The primary users are mariners responsible for maritime navigation. Access to the information is required both onshore and at sea.

SOLAS regulation V/19.2.1.4 describes the requirement for ships to carry "*nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage*". Timely and simple access to uniform up-to-date nautical information for a particular sea area is essential for the conduct of safe voyages.

The nautical chart service provides navigational information for safe navigation on open sea, for making landfall and for navigation in confined waters.

11.7 Information to be provided

The appropriate resolutions and recommendations adopted by IHO provide the recommended set of information to be covered by the nautical chart service.

Information related to:	Examples:
Geographical features	- Coastline - Inland topography - Bathymetry - Rivers
Transits and routeing	- Routes in constricted shipping lanes - Associated Vessel traffic service - Associated Ship reporting system
Ports approaches and entry	- Hazards, directions, limiting conditions - Pilot service, outer anchorages - Aids to navigation
Protected area information	- Locations of marine protected areas - Restrictions and regulations applicable within specific areas
Regulatory information	- Laws and regulations applicable in specific locations - Laws and regulations applying to vessels of specific dimensions or carrying specified cargo - Local rules regarding use of specific pilot boarding places by vessels exceeding specified dimensions or carrying hazardous cargo
Aids to navigation	- Descriptions of lights - Descriptions of buoys
Planning	Mariners' routeing guides
Controlled areas	- Vessel traffic service contact information - Ship reporting system contact information - Exercise area contact information
Metadata	- Update information - Projection/spheroid - Data bounding polygon

11.8 Associated technical services

IHO does not provide any technical services to deliver charts and nautical publications to the end user. This will be done by the technology which is developed by the value-added resellers.

By having established sophisticated secure quality proof transmissions, IHO only ensures that the data will not be corrupted during the transport from the producing HO to the end user.

The Service should include hard media and online delivery mechanisms. The delivery mechanism should make provision for data authentication and data encryption.

(To be further developed)

11.9 Relation to other Maritime Services

Nautical chart service provides overviews of other Maritime Services. It summarizes content information which is covered by other Maritime Services in more detail. Other Maritime Services may reuse information which is provided by the nautical chart service.

Maritime Service	Examples of information related to MS 11
MS 1 – Vessel traffic service	Area of the service, functions, contact information, communication, local sensor information such as CCTV, Radar, AIS. Regulations. Other traffic. Information regarding regulations and special traffic. Recommended routes, directions, navigation advice
MS 2 – Aids to navigation service	Buoys
MS 4 – Port support service	Area of the service, contact information, communication, navigational warnings issued by the MSI service
MS 5 – Maritime safety information service	Pilot boarding areas

MS 12 – Nautical publications service

12.1   Submitting organization

IHO

12.2   Coordinating bodies

IMO and IHO

12.3   Description of the Maritime Service

This Maritime Service delivers a set of nautical information available for a particular marine area. The aim of the nautical publications service is to provide information as a support to the navigation process. This comprises information to complement nautical charts, such as information on ports and sea areas, as well as the contact information of authorities and services for a sea area or port. It further describes regulations, restrictions, recommendations and other nautical information applicable in these areas.

Nautical publications services include:

.1   the information traditionally provided within updated nautical publications such as sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage (SOLAS regulation V/27). The majority of the information can be delivered from shore to ship in a digital format. This will enhance the usability, increase the quality and update rate and give the navigator an opportunity to tailor the information needed;

.2   a discovery service to allow users to determine what is available in their area of interest (geographic and context);

.3   an ordering service to allow users to order the information required from the service providers identified; and

.4   a delivery service to allow the user to receive the information required.

12.4   Purpose

The purpose of this Maritime Service is to electronically provide the mariner with information to complement ENCs/nautical charts for advance planning and to navigate a ship safely during the intended voyage.

The nautical publications service provides information which is continuously updated and which is required for voyage planning and execution. It improves the situational awareness during the voyage.

SOLAS regulation V/2 defines the provision of nautical publication information in digital format as a database and SOLAS regulation V/27 requires the carriage of nautical publications suitable for the intended voyage. The combination of both is a digital provision of nautical information requested for navigation according to SOLAS chapter V.

The information covered in nautical publications is either provided as printed paper publications (NP1) or as digital publications based upon existing paper publications (NP2). The next evolutionary step is the provision of information in digital data sets based on internationally harmonized and appropriate data models (NP3). The data sets will be distributed by appropriate methods to electronic onboard equipment.

The anticipated steps in the transition to full digital delivery can be described only in general terms at this time:

.1   development of product specifications (including data models) for digital data products;

.2   conversion of appropriate parts of the content of existing NP1 and NP2 nautical publications to NP3 data products;

.3   integration of appropriate new sources of nautical publications information into the supply and production chain for NP3 data products;

.4   delivery infrastructure and methods – either the design and construction of new delivery infrastructure/methods, or the integration into existing or under-development delivery infrastructure/methods;

.5   application upgrades or new application development to make best use of the digital products; and

.6   test beds for the data products, delivery methods and applications.

12.5   Operational approach

The data model is based on the IHO S-100 Hydrographic data model and derived product specifications. It enables the information provision in a harmonized way. The products are designed for a display based on *Interim guidelines for the harmonized display of navigation information received via communication equipment* (MSC.1/Circ.1593) and the data provision should take into account a harmonized display of navigational information. The used product specifications comprise rules for interoperation and harmonized graphical presentations of data sets that will be interacting one each other and with the ENC information when used by a navigation system such as ECDIS.

The provision of nautical publications services should use distribution strategies, methods, and technologies which can adapt to serve vessels in locations or conditions that are highly challenging for information transfer.

The data provision follows the S-100 based data protection schema.

12.6   User needs

The primary users are mariners responsible for maritime navigation. Access to the information is required both onshore and at sea.

SOLAS regulation V/19.2.1.4 describes the requirement for ships to carry "*nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage*". Timely and simple access to uniform up-to-date nautical information for a particular sea area is essential for the conduct of safe voyages.

The nautical publications service provides navigational information for safe navigation on open sea, for making landfall, and for navigation in confined waters.

The nautical publications service provides information on Maritime Services available and provides details to get access to responsible authorities and services provided by those authorities.

Secondary users such as Pilot services, defence, VTS Authorities or any individuals or organizations, onshore and at sea, require access to the information for reference.

12.7   Information to be provided

The appropriate resolutions and recommendations adopted by IHO provide the recommended set of information to be covered by the nautical publications service.

Information related to:	Examples:
Transits and routeing	- Routes in constricted shipping lanes - Routeing measures, traffic separation schemes and shipping lanes - Associated Vessel traffic service - The mandatory reporting of vessel traffic movements - Associated Ship reporting system
Ports approaches and entry	- Hazards, directions, limiting conditions - Pilot service, outer anchorages - Traffic regulation, arrival procedure
Summary information about port facilities	- Function, port authority - Basins and berths - Depth alongside berths, and quay lengths - Cargo handling facilities at specified terminals and berths - Specific vessel parameters, such as length, draft, beam
Marine radio services	- Geographic availability of services - Frequencies and channels used and broadcast schedules - Purposes supported – weather forecasts, MSI, telemedical assistance, etc.
Protected area information	- Locations of marine protected areas - Restrictions and regulations applicable within specific areas
Prevailing natural conditions	- Seasonal hazardous conditions - Periodic (e.g. tide-related) or irregular hazardous conditions
Regulatory information	- Laws and regulations applicable in specific locations - Laws and regulations applying to vessels of specific dimensions or carrying specified cargo - Local rules regarding the use of specific pilot boarding places by vessels exceeding specified dimensions or carrying hazardous cargo
Port Services	- Waste disposal, collection of ship pollutants such as oily wastes - Repair, bunkering - Availability of potable water - Issuing of Ship Sanitation Certificates - Pilot services contact information and notice times

Information related to:	Examples:
Aids to navigation	• descriptions of lights • descriptions of buoys
Climatic Information, predictions	• Tide surge prediction tables and tidal stream atlases • Weather routeing, solar radiation and precipitation • Cold/hot durations and warnings • Air temperature, wind speed and direction • Cloudiness and barometric pressure • Ephemerides and nautical almanacs for celestial navigation
Planning	• Mariners' routeing guides
Controlled areas	• Vessel traffic service contact information • Ship reporting system contact information • Exercise Area contact information
Chart catalogue	• Graphically display a chart catalogue[9]

The nautical publications service provides up-to-date information pertaining to the area along the planned route.

Users should be enabled to report discrepancies between the real world and the information provided by the Nautical publications service with no or minimal human interference.

Corrections to nautical publications service information should be provided as updates (either as updates of the whole data set or as incremental updates) in a format which supports the automatic correction and the traceability of the corrections of the onboard data sets.

12.8   Associated technical services

IHO does not provide any technical services to deliver charts and nautical publications to the end user. This will be done by the technology which is developed by the value-added resellers.

By having established sophisticated secure quality proof transmissions, IHO only ensures that the data will not be corrupted during the transport from the producing HO to the end user.

The service should be capable of working within multiple levels of bandwidth limitations. The service should provide the data in various data packages according to the bandwidth capability.

12.9   Relation to other Maritime Services

Nautical publications service provides overviews of other Maritime Services. It summarizes content information which is covered by other Maritime Services in more detail. Other Maritime Services may reuse information which is provided by the nautical publications service.

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[9]   To fulfil IEC61174 "in order to identify the date and origin of the ENC in use, the ECDIS shall include a graphical index of ENC data available, presented upon the mariner's request and providing access to the edition and date of each cell."

Maritime Service	Examples of information related to MS 12
MS 1 – Vessel traffic service	Area of the service, functions, contact information, communication, local sensor information such as CCTV, Radar, AIS. Regulations. Other traffic. Information regarding regulations and special traffic. Recommended routes, directions, navigation advice
MS 2 – Aids to navigation service	Lighthouses
MS 4 – Port support service	Port security, facilitation and anchorage area, services related to the vessel, arrival procedure, contact information, communication
MS 5 – Maritime safety information service	Area of the service, contact information, communication, navigational warnings issued by the MSI service
MS 6 – Pilotage service	Applicability, contact information for pilotage, pilot assistance, pilot request
MS 7 – Tug service	Availability, contact information, regulations
MS 8 – Vessel shore reporting	Applicability, information about the reporting formalities, local regulations, contact information
MS 9 – Telemedical assistance service	Contact information
MS 10 – Maritime assistance service	Contact information
MS 11 – Nautical chart service	Charted information, notice to Mariners
MS 13 – Ice navigation service	Ice routes, ice-breaking assistance
MS 14 – Meteorological information service	Local weather phenomena, climatic information, wave information
MS 15 – Real-time hydrographic and environmental information services	Information about sensors in an area, radio services information
MS 16 – Search and rescue service	Search and rescue contact information, communication, SAR capacity, SAR areas of responsibility

MS 13 – Ice navigation service

13.1   Submitting organization

WMO

13.2   Coordinating bodies

IMO and WMO

13.3   Description of the Maritime Service

To provide ice navigation information to maritime users in the vicinity of ice-infested regions.

13.4   Purpose

The World Meteorological Organization's Manual on *Marine Meteorological Services* (WMO No.558) defines the procedures for marine meteorological information text bulletins involving ice-related components in high seas areas, coastal, offshore and local waters, for decision-making on whether or not to proceed with ice navigation.

SOLAS regulation V/5 outlines obligations for the provision of weather information suitable for shipping with forecasts including ice conditions and hazards.

The International Code for Ships Operating in Polar Waters (Polar Code) sets the safety and environmental information requirements for ships operating in polar waters. The Polar Code reinforces operating guidelines for the hazard of ice accretion and ice-covered waters. The Polar Code introduces operating guidelines for hazards related to sea ice, icebergs, and low air temperature, and defines the polar service temperature for equipment performance.

The standards for the ice terminology and symbology, including sea ice, ice of land origin (icebergs) and lake ice are set by the WMO publication No. 259 "*WMO Sea-Ice Nomenclature*" (vol.I – Terminology, vol.III – International System of Sea-Ice Symbols) with the former Joint WMO-IOC Commission for Oceanography and Marine Meteorology (JCOMM) publications TR-080 "*Electronic Chart Systems Ice Objects Catalogue*" and TR-081 "*S-411 Ice Information Product Specification*" documenting coding and portrayal of ice conditions on electronic navigational chart systems.

WMO publication No. 574 "*Sea-Ice Information and Services*" has comprehensive up-to-date information on national and regional ice services. Resolution A.1051(27), as amended, on *IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document* outlines the functions of the IMO-WMO Worldwide Met-Ocean Information and Warning Service (WWMIWS). The WWMIWS provides met-ocean maritime safety information (MSI) including sea-ice conditions, icebergs and other related hazards to mariners.

13.5 Operational approach

Examples of ice navigation services are listed in table 13-1.

Information related to:	Examples:
Ice conditions (as an ice chart)	Near real-time analysis and forecasts of: - sea ice concentration; - sea ice stage of development (or thickness); - form of sea ice; - ice dynamics (ridging, pressure, drift); - location and orientation of leads, cracks; - icebergs location, concentration and drift; and - limits of all known sea ice, iceberg risk and/or ice edge
Ice reports and bulletins	Text summaries of ice conditions
Routeing aids	Recommended routes Support to ice navigator/pilot Support to icebreaker assistance
Navigation Planning	Ice climatology Impact-based decision support Application for navigation (from relevant bodies)

Table 13-1: Ice Navigation Service

The most important features of sea ice which affect marine operations are:

.1   the amount of ice present, i.e. concentration usually measured as tenths of the sea surface covered by ice;

.2   ice thickness, referred to as stage of development which is related to ice age;

.3   form of ice, i.e. whether it is fast ice or drifting ice, floe size;

.4   ice dynamics including ridging, pressure, drift; and

.5   location and orientation of leads and cracks.

The positions of icebergs at specified times are required with information about their estimated size, concentration or number within a certain area, and speed and direction of movement.

13.5.1 Ice analysis and forecast

Some 22 States around the world offer ice information services. Services may provide analysis of ice conditions and numerical short-term ice forecasts in the form of ice charts once a day or less for a period of 24 to 144 hours. These are tactical forecasts and may provide advice on difficult ice conditions forming or dissipating, the general motion of the pack, opening and closing of leads, etc. They are strongly influenced by meteorological prediction and should always be used in concert with the weather forecast. The ice charts may be complemented by high- and medium-resolution satellite imagery – commonly from synthetic aperture radar (SAR) and optical sensors, with resolution and range dependent on the season, region, cloud conditions and type of support. Near coast operations may be complemented by shore-based ice radar imagery.

Other longer-range predictions – those covering periods from 7-10 days to 30 days and seasonal predictions – are based on numerical, climatological, analogue or statistical methods.

13.5.2   Vessel escort and ice-breaking

Ice-breaking and support services may be available to ships transiting ice-covered waters. Coastguards or other national agencies may operate ice operations centres. These centres generally provide up-to-date ice information, suggest routes for ships to follow through or around ice and coordinate icebreaker assistance to shipping. Ice operations centres are generally in contact with icebreakers at all times and monitor the progress of shipping within their area of responsibility. Ice operations centres may also provide recommended ice route services, such as routeing maps.

13.5.3   Ice navigation planning

A voyage in ice-covered waters is commonly preceded by planning and acquisition of permission for ice navigation in contact with regulatory bodies and ice-breaking services. The planning and application process is dependent on the assigned ice class, region and season of navigation and is done using the relevant organizations in the region of operation covering risk assessment for voyage planning, especially in bergy water operations, and other regulatory criteria.

13.6   User needs

Depending on the activity and environment, users require ice navigation information for different time and space scales. Examples are provided in the table below:

Information related to	Examples
En route or at sea	Broad, area-based forecasts Higher detail in complex waterways Real-time observations Increased interest in synoptic features and movement Focused on longer forecast lead time
Entering, transiting and exiting a port	Point (small area) based forecasts High spatial and temporal detail Real-time observations Focus on short-term lead time
At berth	Forecasts of changes to ice conditions
Planning a trip or maritime activity	Focus on short-term time frames, as well as longer forecast lead times Forecasts and warnings Specific details on the timing of wind changes or hazardous weather leading to changes in ice conditions Focus on forecast details for specific areas or routes Information for risk assessment
Vessel and equipment design	Historical sea ice and iceberg conditions Focus on ocean and sea routes

13.7   Information to be provided

Technical services used for the implementation of this Maritime Service are provided by Marine Meteorological Services (MMS). S-411 Ice Information is the product specification for encoding sea-ice information provided by MMS based on the IHO S-100 framework specification and the ISO 19100 series of standards.

Information elements provided in this Maritime Service may include but are not limited to:

.1   warnings and forecasts for the high seas and coastal, offshore, and local areas (including ports and harbours) in consonance with resolution A.705(17), as amended, on *Promulgation of maritime safety information* and under the guidance of publication WMO No.558;

.2   wind, waves and atmospheric, oceanographic and maritime polar conditions as described in WMO's *Guide to Marine Meteorological Services* (WMO No.471);

.3   broadcast of meteorological maritime safety information as articulated in SOLAS regulation V/5 using the methods defined in resolution A.1051(27), as amended;

.4   electronic chart display and information system (ECDIS) sea ice and iceberg information using S-100 based product specifications (S-411).; and

.5   ice information services and their products are listed in WMO's *Sea-ice Information and Services* (WMO No.574).

13.8   Associated technical services

Name	Standardization Body
Ice service	WMO
Ice chart	WMO
Ice edge and icebergs location	WMO

13.9   Relation to other Maritime Services

Maritime Service	Examples of data that could be used in MS 13
MS 5 – Maritime safety information service	Provides supplemental up-to-date information on the status of ice dangers
MS 11 – Nautical chart service	Provides supplemental navigational information
MS 12 – Nautical publications service	Provides supplemental navigational information
MS 14 – Meteorological information service	Provides supplemental navigational (meteorological) information
MS 15 – Real-time hydrographic and environmental information services	Provides supplemental navigational (hydrographic) information

MS 14 – Meteorological information service

14.1   Submitting organization

WMO

14.2   Coordinating bodies

IMO and WMO

14.3   Description of the Maritime Service

To provide meteorological information to maritime users.

14.4   Purpose

The World Meteorological Organization's *Manual on Marine Meteorological Services* (WMO No. 558) defines two types of marine meteorological information:

- warnings and forecasts for the high seas; and

- warnings and forecasts for coastal, offshore, and local areas including ports and harbours).

SOLAS regulation V/5 requires Contracting Governments to produce and distribute to shipping warnings about severe weather such as gales, storms and tropical cyclones, and to produce and provide other weather information suitable for shipping consisting of data, analyses, warnings and forecasts of weather, waves and ice at least twice daily (WMO No. 558, 2.2.15).

Resolution A.1051(27), as amended, on *IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document* outlines the functions of the IMO/WMO Worldwide Met-Ocean Information and Warning Service (WWMIWS). The WWMIWS provides meteorological maritime safety information (MSI) to mariners in the form of marine warning and forecast products. The WWMIWS is coordinated across the world's oceans through 21 defined areas, called METAREAs. Ships receive the MSI products via marine communication systems such as EGC services and NAVTEX, which form part of the Global Maritime Distress and Safety System (GMDSS).

SOLAS regulation V/34, resolution A.893(21) on *Guidelines for voyage planning* and MSC.1/Circ.1063 on *Participation of ships in weather routeing services*, outline the minimum characteristics for a service. SOLAS regulation V/5 states that met-ocean services shall be issued by the national meteorological service. WMO and its Members should oversee marine meteorological services and standards.

Details of service availability, broadcast times and radio frequencies for services provided to vessels at sea are maintained in the WMO publication: WMO No. 9, volume D, *Information for Shipping.*

Examples of information provided by marine meteorological services are listed in the table below:

Information related to:	Examples:
Wind	Forecast wind speed, direction, gust information Real-time values from instruments or satellite
Waves	Forecast wave height, direction, period Real-time values from instruments or satellite
Atmospheric conditions	Forecast temperature, squalls, cloud, rainfall Real-time values from instruments or satellite
Ocean	Forecast surface temperature, currents, salinity Forecast subsurface temperature and currents Real-time values from instruments or satellite
Weather systems	Mean sea level pressure contours System features such as cold fronts, tropical cyclones, low pressure centres, high pressure centres Satellite images
Dangerous weather	Warnings about location, strength, and movement of storms Warnings about fog or phenomena causing reduced visibility, ice accretion, cold air temperature, squalls
Low air temperature	Forecasts of hazard areas Historical values for ocean and port areas
Ship observations	Receipt of reports from ships in the Voluntary observation system Transmission of information extracted from received ship reports to shipping

Table 14-1 – Examples of information provided by marine meteorological services

MS14 can be delivered in all areas.

14.5   Operational approach

In general, marine meteorological services have two functions:

.1   to serve international shipping, fishing and other marine activities on the high seas; and

.2   to serve the various activities which take place in coastal and offshore areas, ports and on the coast.

SOLAS regulation V/34 and resolution A.893(21) on *Guidelines for voyage planning* describe how vessels should prepare for their trip and route and therefore their information requirements. The resolution specifically outlines to small vessels the importance of:

• checking the forecast meteorological information/conditions for the journey;

• knowing the tides; and

• knowing the vessel limitations for weather and wave conditions.

SOLAS regulation V/5 describes the underlying obligations for weather services, i.e. conveying warnings about severe weather and other weather information useful for shipping, and facilitating weather reports by ships and their distribution as needed for the safety of navigation.

In general, the impact which could result from a meteorological condition depends on its severity and on the sensitivity of a particular activity or operation to that condition. Similarly, meteorological phenomena can make recreational activities and the work of fishing and shipping fleets much more difficult or hazardous.

Marine operations are sensitive to environmental conditions. Generally, extreme values of waves, wind and obstructions to visibility increase the risk to the safety of the vessel or sea structure and to the persons involved in the operation. Less extreme values, even if safety is not threatened, will affect the efficiency, effectiveness or comfort of the operation.

Warnings of ice accretion highlight areas where the accumulation of ice on the superstructure and deck equipment of vessels may potentially affect safety and operational efficiency.

Information about extremely low air temperatures is important for the safety of workers, while historical information about cold air temperatures enables planning and ship design based on the polar service temperature guidelines.

14.6   User needs

Depending on the activity and environment, users require marine meteorological information for different time and space scales. Examples are provided in the table below:

Information related to	Examples
En route or at sea	Broad, area-based forecasts Higher detail in complex waterways Real-time observations Increased interest in synoptic features and movement Focus on longer forecast lead time
Entering, transiting and exiting a port	Point (small area) based forecasts High spatial and temporal detail Real-time observations Warnings of reduced visibility, squalls Focus on short-term lead time
At berth	Warnings of squalls, thunderstorms Forecasts of general weather conditions
Planning a trip or maritime activity	Focus on short-term time frames, as well as longer forecast lead times Increased interest in synoptic features and movement Warnings and forecasts Specific details on timing of wind changes or hazardous weather Focus on forecast details for specific areas or routes
Vessel and equipment design	Historical values of low air temperatures and water temperatures Focus on ocean and sea routes

14.7 Information to be provided

Technical services used for the implementation of this Maritime Service are provided by marine meteorological services (MMS). S-412 *Weather and Wave Hazards*, S-413 *Weather and Wave Conditions* and S-414 *Weather and Wave Observations*, all under development, are product specifications for encoding meteorological information provided by MMS based on the IHO S-100 framework specification and the ISO 19100 series of standards.

Information elements provided in this Maritime Service may include but are not limited to:

.1 warnings and forecasts for the high seas and coastal, offshore, and local areas (including ports and harbours) in consonance with resolution A.705(17), as amended, on *Promulgation of maritime safety information* and under the guidance of publication WMO No. 558;

.2 marine meteorological conditions as described in WMO's *Guide to Marine Meteorological Services* (WMO No. 471);

.3 broadcast of meteorological maritime safety information as per SOLAS regulation V/5 using the methods defined in resolution A.1051(27), as amended; and

.4 electronic chart display and information system (ECDIS) meteorological information under development on S-100 based product specifications (S-412 to S-414).

14.8 Associated technical services

Name	Standardization body
Warnings and forecasts	WMO
Marine meteorological conditions	WMO
Broadcast of meteorological MSI	IMO and WMO
Meteorological information under development on S-412, S-413 and S-414 based product specifications	IHO and WMO

14.9 Relation to other Maritime Services

Maritime Service	Examples of information related to MS 14
MS 5 – Maritime safety information service	Provides supplemental up-to-date information on the status of extreme weather
MS 11 – Nautical chart service	Provides supplemental navigational information
MS 12 – Nautical publications service	Provides supplemental navigational information
MS 13 – Ice navigation service	Provides supplemental navigational information
MS 15 – Real-time hydrographic and environmental information services	Provides supplemental navigational information

MS 15 – Real-time hydrographic and environmental information services

15.1   Water level information for navigation

15.1.1   Submitting organization

IHO

15.1.2   Coordinating bodies

IMO and IHO

15.1.3   Description of the Maritime Service

Oceanic and inland water level information is essential for the determination of under-keel clearance required for safe navigation. Real-time water level information is important for applications such as route planning port entry and the determination of tidal prediction. Water level information consists of:

.1   observed and/or forecasted time series at one or more fixed stations;

.2   forecasted gridded forecasts of water level for one or more regions; and/or

.3   a gridded hydroid surface.

15.1.4   Purpose

The development of electronic navigation systems that use high-resolution bathymetric data demands the provision of real-time water level data. The IHO water level specification provides a standardized mechanism to digitize and transfer water level data.

15.1.5   Operational approach

Water level data is usually provided by hydrographic organizations, or on their behalf by an approved authority. Data sets are based on an internationally harmonized model and data encoding specification. Water level data sets will be provided via online Internet services or distributed by appropriate distribution networks used for other navigational products and services.

15.1.6   User needs

Tidal and/or tidal water information is intended for activities such as situational awareness, hazard avoidance, works on offshore renewable energy installations and route planning. Knowledge of water levels and under-keel clearance water along a planned route, and for some time in the future, can help planners select the most efficient time and safest route for transit.

15.1.7   Information to be provided

Digital water level metadata and catalogue information is encoded using the Extensible Markup Language (XML). The Hierarchical Data Format (HDF5) is used for water level surface coverage data.

15.1.8   Associated technical services

(To be further developed)

15.1.9   Relation to other Maritime Services

This product may conflict with simplified information on water levels that are included with many nautical charts. The data from this product should have "display priority" over older simplified water level information.

Maritime Service	Examples of information related to MS 15
MS 11 – Nautical chart service	Underlying chart layout, simplified water level information
MS 12 – Nautical publications service	Description of long-term tidal observations
MS 14 – Meteorological information service	Information on storm surges
MS 16 – Search and rescue service	Tidal influences on rescue operations

15.2   Surface water currents for navigation

15.2.1   Submitting organization

IHO

15.2.2   Coordinating bodies

IMO and IHO

15.2.3   Description of the Maritime Service

This Maritime Service provides digital information on surface current speed and direction to land-based and shipboard ECDIS. The information consists of:

> .1   time series at one or more fixed stations;
>
> .2   gridded forecasts of surface currents for one or more regions; and/or
>
> .3   time series at a moving (i.e. drifting) station.

Surface current information is portrayed as colour-codes vector lines, with additional information available via mouse pick command.

15.2.4   Purpose

This Maritime Service includes:

- surface current vector and tidal information, intended for situational awareness;
- hazard avoidance;
- works on offshore renewable energy installations; and
- route planning.

The implementation of this service should result in improved safety and cost reductions due to time and fuel efficiencies. The associated product specification implemented an update mechanism to ensure that the latest data is available to the mariner and other users.

This Maritime Service includes:

- information traditionally provided within nautical publications such as tide and surface current information necessary for the route planning (link with SOLAS);

- surface current vector and tidal information, intended for situational awareness, hazard avoidance, works on renewable marine energy and route planning;

- information derived from observations and/or from a numerical model;

- a service to allow users to determine what is available in their area of interest (geographic and context);

- an ordering service to allow users to order the information required from the service providers identified; and

- a delivery service to allow the user to receive the information required.

The service provides information on current and tide in complement to ENCs/nautical charts.

15.2.5   Operational approach

Data are created by hydrographic organizations and are disseminated via the Internet or other available channels.

One evolution of the marine service is the provision of data sets information based on an internationally harmonized and appropriate model. The data sets will be distributed by appropriate methods for use by onboard navigation equipment.

15.2.6   User needs

Surface current vector information and water level are intended for situational awareness, hazard avoidance (storm surge forecast, analysis, marine submersion) and route planning. Upon entering a harbour or other confined body of water, knowledge of currents is essential to pilots to avoid hazards. Knowledge of currents and under-keel clearance water along a planned route, and for some time in the future, can help planners to select the most efficient time and route for transit.

15.2.7   Information to be provided

Data is contained in XML files that consist of metadata and HDF5 data files containing arrays of speed and direction information, tidal amplitude, tidal water level and water level. This Information and all other necessary information is provided in various IHO standards (e.g. S-111, S-104 IHO recommendations).

15.2.8   Associated technical services

(To be further developed)

15.2.9   Relation to other Maritime Services

This product may conflict with simplified information on tidal currents, chart datums, tidal water levels, that are included in nautical charts. The data from the new product must have display priority over the older simplified information.

Maritime Service	Examples of information related to MS 15
MS 11 – Nautical chart service	Underlying chart layout, simplified water movement information
MS 12 – Nautical publications service	Description of long-term current observations
MS 14 – Meteorological information service	Information on storm surges
MS 16 – Search and rescue service	Current influences on rescue operations

MS 16 – Search and rescue service

16.1   Submitting organization

Norway

16.2   Coordinating bodies

IMO, Norway and Singapore

16.3   Description of the Maritime Service

The International Convention on Maritime Search and Rescue, 1979 (SAR Convention) was aimed at developing an international SAR plan to ensure that everywhere in the world, the rescue of persons in distress at sea would be coordinated by a responsible SAR organization or by cooperation between neighbouring SAR organizations.

Following the adoption of the 1979 SAR Convention, the Maritime Safety Committee divided the world's oceans into 13 search and rescue areas, with provisional SAR plans in place for each of these areas. In each area, the countries concerned have search and rescue regions for which they are responsible.

Parties to the Convention must ensure that arrangements are made for the provision of adequate SAR services in their coastal waters. Parties are encouraged to enter into SAR agreements with neighbouring States involving the establishment of SAR regions, the pooling of facilities, establishment of common procedures, training and liaison visits. The Convention also states that Parties should take measures to expedite entry into its territorial waters of rescue units from other Parties.

The Convention then goes on to establish preparatory measures which should be taken, including the establishment of rescue coordination centres (RCCs) and sub-centres. It establishes a common glossary to be used by all Parties and outlines operating procedures to be followed in the event of emergencies/alerts and during SAR operations. This includes the designation of an on-scene commander and their duties.

IMO and the International Civil Aviation Organization (ICAO) jointly publish the three-volume IAMSAR Manual. This manual provides international guidelines for a common aviation and maritime approach to organizing and providing SAR services. The three volumes are divided as follows:

- Volume I, Organization and Management;

- Volume II, Mission Coordination; and

- Volume III, Mobile Facilities.

16.4   Purpose

The RCC responsible for the Search and Rescue Region (SRR) is the primary contact in a SAR incident and ultimately responsible for incident management and decision-making.

In maintaining a state of full readiness, the service is responsible for a number of search and rescue functions, including:

- detection and coordination of maritime incidents; and

- control and conduct of maritime search and rescue operations.

These functions may include activities such as:

- assisting the crew and passengers of vessels in distress;

- assisting victims of maritime and aircraft accidents or incidents;

- coordinating the medical evaluation of seriously injured or ill persons from a vessel at sea, and their subsequent evacuation, if deemed necessary, to a suitable medical facility;

- monitoring towing operations;

- monitoring and evaluating levels of risk from maritime safety information (MSI) broadcasts to ensure an immediate response to potential life-threatening situations;

- monitoring vessels not under command;

- monitoring pollution reports and vessels aground;

- assisting other emergency response organizations when they require additional resources to prevent loss of life; and

- liaising with other organizations assisting with search and rescue operations information collection, distribution, and coordination.

16.5   Operational approach

Time, resources and effective communication will always be challenges when it comes to search and rescue cases involving human lives. Effective use of time and allocation of rescue resources to the person(s) in distress are of primary importance.

Several actors are normally involved in a SAR operation. Manual exchange of information can be easily misunderstood in the form of wrong positions, SAR areas and other significant search information, and even a short delay can be the difference between life and death. Lack of language skills has been identified as a major challenge in SAR communications.

Digital exchange and sharing of information could significantly reduce the human errors in SAR case prosecution and also result in huge time savings by allowing RCCs more timely access to accurate and relevant information.

Examples of information for SAR coordination communications that could be shared electronically to mitigate these challenges include:

- last known position (LKP);

- search areas;

- search patterns;

- search resources;

- drift predictions;

- last known position (LKP);

- datum;

- radio frequencies;

- NOTSHIPs;

- known routeing and planning information for search object (in the case of overdue aircraft or vessels);

- EPIRB hex codes and associated information;

- SLDMB information;

- satellite imaging;

- live stream and images from search resources;

- images of search objects;

- images of search area; and

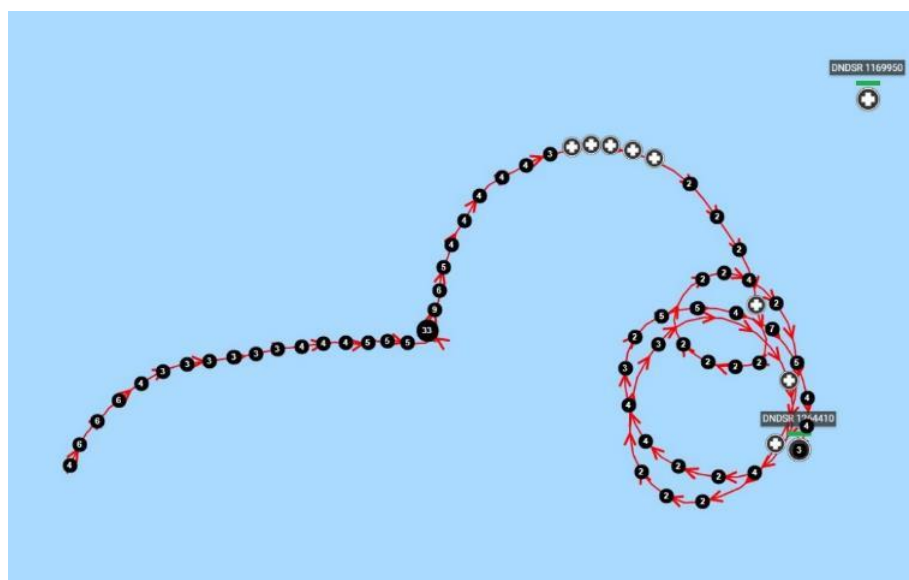- SAR Briefing Report (with information for vessels engaged in search).

Figure 16-1: Simulation of drift prediction
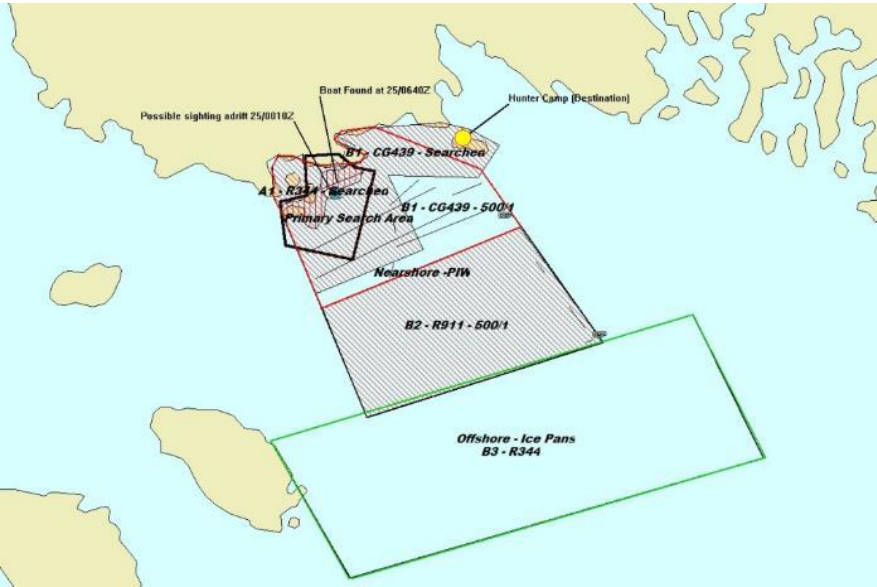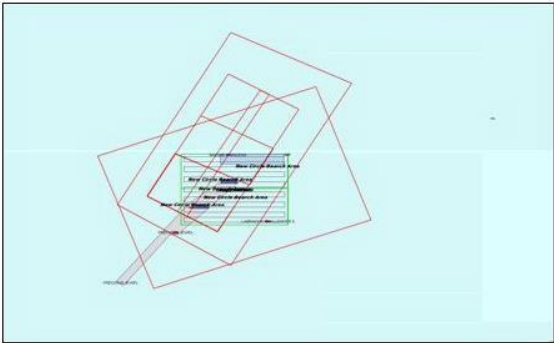**Credit photo: JRCC Halifax**

**Figure 16-2: Illustration of search areas and additional information
that may be used during a SAR operation
Credit photo: JRCC Halifax**

SAR BRIEFING REPORT
Vessel Name

General	
SAR	Man overboard
SITUATION	Man Overboard
DATE	01 Sep 2015
TIME	07:56
INCIDENT#	C2018-00302
LOCATION	118' ExN of Cape Bauld
N	52°17.30'N
W	052°29.5'W
CALL SIGN	n/a
POB	0

Nature of distress Man Overboard

Tasking SRU Name: Vessel Name, Sortie #: 425891,

Description Person in the water, crew member from the FV Precious Jewel

Other Info 32 YOM, no floatation

Medical Info

On Scene Comd Alfred Needler

POBs John Doe (Age: 33, Gender: Male)

Proceed search area made up of points 52 17.8N 052 32.4W, 52 29.8N 052 20.7W, 52
30.3N 052 21.9W, 5218.3N 052 33.6W. CSP will be 52 17.8N 052 32.4W head NW @ 030T for
14nm then reverse track with 1/4nm track spacing

**Figure 16-3: Illustration of a SAR briefing report
Credit photo: JRCC Halifax**

The RCC could then deliver this important information about the SAR situation to a graphical display shared with the on-scene commander, search resources and all partners involved, improving communications and increasing situational awareness for everyone. This would make it easier for all units to get current information on the search operation under way.

Information from several services assists the SAR Coordinators in making timely decisions and appropriate use of resources. Some examples would include:

- vessel information such as position, course and speed;

- medical and fire-fighting capabilities of nearby resources;

- other emergency organizations in the area and their rescue capabilities;

- meteorological information (including tides and currents, ice information);

- maritime safety information; and

- ship reporting information such as persons on board, capacity, cargo information.

16.6   User needs

Coordination, communication and effective exchange of information are important elements of the SAR service. The coordinating RCC must be able to share and receive information quickly and easily with a number of different resources:

- other RCCs;

- vessels assisting in search and transiting search area;

- VTS services;

- ground search and rescue;

- search target;

- other emergency organizations (for example, police, fire, ambulance); and

- port authorities.

Information related to:	Examples
General information	• Responsible RCC • Other emergency organizations assisting
SAR information	• Type of operation • What and when • Last known position • Drift plot • Number persons missing/in distress • Dangers such as dangerous substances • In raft, lifeboat, persons in water, etc. • Datum

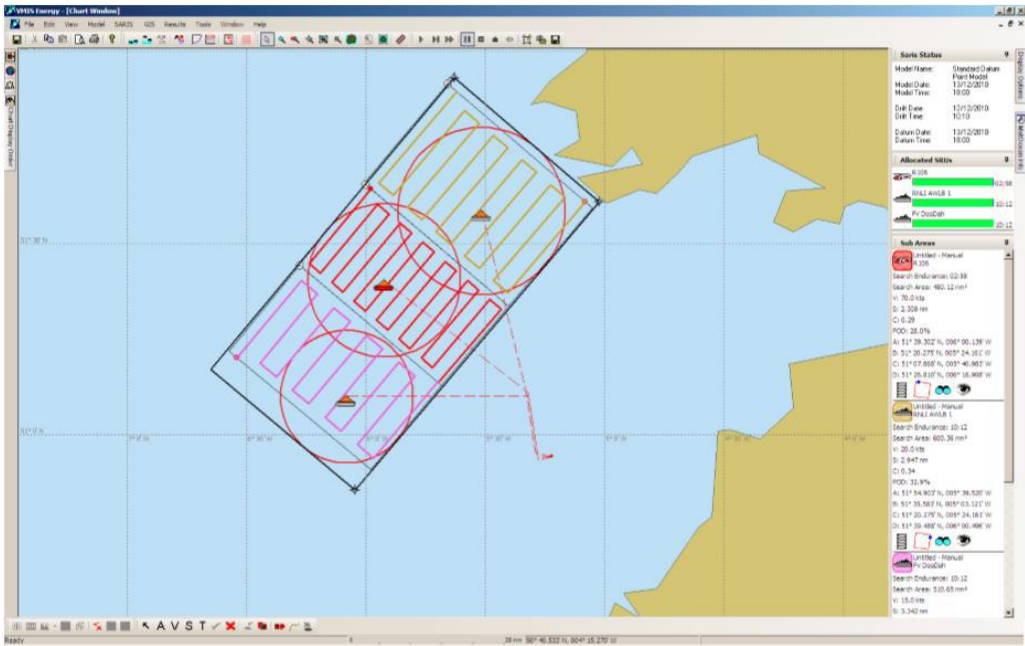| Information related to:	Examples
	• SAR area • SAR resources in area • Vessels of opportunity within and near search area • Vessels and aircraft involved in search • Search areas assigned and completed • On-scene coordinator • Communication • Meteorological information
Assistance	• Position of vessels or stations assisting • Towing vessels available and positions • Capacity, bollard pull (BP) • Other salvage and oil recovery capacities • Response time • Connection information • Intended route / towing plan • Speed limits • Manoeuvring limits • Communication

Figure 16-4: Example of common sharing of digital search and rescue information

16.7   Information to be provided

(Under development)

16.8   Associated technical services

(To be further developed)

16.9 Relation to other Maritime Services

Maritime Services	Examples of information related to MS 16
MS 1 – Vessel traffic service	Information on VTS areas, places of refuge, vessel traffic in the area, vessel identification information (type of vessel, nationality, MMSI, IMO number, contact information), information from sensors (meteorological, hydrographical, visibility, etc.), radar, AIS, CCTV, communication with ship, exchange of routes, navigation advice and assistance
MS 4 – Port support service	Port availability and anchorage areas, berthing information, cargo operations, security, supply, available assistance, port contact information
MS 5 – Maritime safety information service	Warnings, no-go areas, diving operations, exercises
MS 6 – Pilotage service	Pilot boarding stations, pilot vessel positions and orders, contact information, request procedures
MS 7 – Tug service	Tug operations, available tug capacity
MS 8 – Vessel shore reporting	ETAs, notification of arrival, vessel information, cargo information, number of persons on board
MS 9 – Telemedical assistance service	Local address of medical centres and communication and capacity, medical advice
MS 10 – Maritime assistance service	Contact information, places of refuge, routeing, information about vessels requesting relevant MAS, incidents, notifications
MS 11 – Nautical chart service	Local area updates, chart updates, notice to mariners
MS 12 – Nautical publications service	Local descriptions and publications, digital information from nautical publications relevant to the operation
MS 13 – Ice navigation service	Ice forecast, ice chart, ice conditions, information regarding icebreaker service/assistance, ice routes
MS 14 – Meteorological information service	Weather in SAR area
MS 15 – Real-time hydrographic and environmental information services	Tidal and current information in SAR area, all information from real-time sensors

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