

IMO/IHO HARMONIZATION GROUP ON
DATA MODELLING
2nd meeting

HGDM 2/10
2 November 2018
ENGLISH ONLY

**REPORT OF THE SECOND MEETING OF THE
IMO/IHO HARMONIZATION GROUP ON DATA MODELLING**

1 INTRODUCTION

1.1 The second meeting of the IMO/IHO Harmonization Group on Data Modelling (the Group) was held at IMO Headquarters in London, from 29 October to 1 November 2018, chaired by Mr. Sunbae Hong (Republic of Korea).

1.2 The Group was attended by delegations from the following Member States:

AUSTRALIA	MARSHALL ISLANDS
BRAZIL	NORWAY
CANADA	REPUBLIC OF KOREA
CHINA	SWEDEN
EGYPT	TURKEY
GERMANY	UNITED KINGDOM
JAPAN	UNITED STATES

1.3 The Group was also attended by observers from the following intergovernmental organizations:

INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)
EUROPEAN COMMISSION (EC)

1.4 Observers from the following non-governmental organizations in consultative status also attended the meeting:

INTERNATIONAL CHAMBER OF SHIPPING (ICS)
INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
INTERNATIONAL ASSOCIATION OF MARINE AIDS TO NAVIGATION AND
LIGHTHOUSE AUTHORITIES (IALA)
COMITE INTERNATIONAL RADIO-MARITIME (CIRM)
BIMCO
INTERNATIONAL MARITIME PILOTS' ASSOCIATION (IMPA)
INTERNATIONAL HARBOUR MASTERS' ASSOCIATION (IHMA)

2 ADOPTION OF THE AGENDA (AGENDA ITEM 1)

2.1 The Group noted and agreed on the provisional agenda as set out in document HGDM 2/1.

3 CONSIDERATION OF THE REPORTS OF NCSR 5 AND MSC 99 AND ANY RELATED MATTERS EMANATING FROM IMO MEETINGS (AGENDA ITEM 2)

3.1 The Group recalled that NCSR 5, after the consideration of the report of HGDM 1 (NCSR 5/8) and having further developed the Guidance on the definition and harmonization of the format and structure of Maritime Services within a Maritime Service Portfolio (MSP) (NCSR 5/WP.4, annex 2), had invited MSC 99 to authorize the holding of the second meeting of the HGDM and, in this respect, approved its terms of reference (NCSR 5/WP.4, annex 5). In doing so, NCSR 5 also instructed HGDM 2 to consider the development of a sustainable continuous review process for the future review of the templates for Maritime Service descriptions after the finalization of the Guidance, without substantive involvement of organs of the Organization.

3.2 Subsequently, MSC 99 authorized the holding of the second meeting of the IMO/IHO Harmonization Group on Data Modelling to take place from 29 October to 2 November 2018 at IMO Headquarters and endorsed the action taken by NCSR 5, as an exceptional case, in authorizing the Secretariat to submit the report of HGDM 2 to NCSR 6 three weeks beyond the deadline for submission of bulky documents, i.e. by Tuesday 6 November 2018.

4 CONSIDERATION OF REPORTS ON DEVELOPMENTS EMANATING FROM IHO MEETINGS (AGENDA ITEM 3)

4.1 The Group noted the information contained in document HGDM 2/3 (IHO) providing a summary of the status of the S-100 Standard, and relevant product specifications under development and in particular, that:

- .1 edition 3.0.0 of the S-100 Standard (S-100) had been published by IHO in April 2017 and a new edition 4.0.0 was expected to be released in January 2019;
- .2 the IHO GI Registry (the basic operative element of the S-100 Standard framework) had been operational for a few years and held several thousand of items registered by several participating domain organizations. In response to the requirements to extend the scope and functions of the current version, a new IHO GI Registry version was under development and was expected to be operational during the first quarter of 2019;
- .3 in order to design, test and evaluate S-100 conformant product specifications for operational use, a number of software tools and test datasets had been produced. Many of these applications were freely available for testing. Others would be made available when they become more mature; and
- .4 a number of test bed projects had been or were about to be conducted to test the use and interoperability of certain S-100 based datasets. These ongoing tests were useful to resolve products interoperability issues.

4.2 During the consideration, a question was raised regarding S-101 and how ECDIS systems would be affected when this version was released. In response to that question, IHO indicated that before any standards were approved for operation a full testing would be conducted. IHO also added that S-100 framework made provision for machine readable catalogues which would facilitate the implementation of product specification updates and extensions.

5 DRAFT GUIDANCE ON THE DEFINITION AND HARMONIZATION OF THE FORMAT AND STRUCTURE OF MARITIME SERVICES WITHIN A MARITIME SERVICE PORTFOLIO, INCLUDING ASSOCIATED TEMPLATES (AGENDA ITEM 4)

5.1 The Group noted that three documents had been submitted under this agenda item, namely HGDM 2/4 and HGDM 2/4/2 (Norway), and HGDM 2/4/1 (IHMA). The Group agreed to consider document HGDM 2/4, containing draft templates proposed for Maritime Services without an identified domain coordinating body, under item 5.

5.2 The Group considered document HGDM 2/4/1 providing comments on the high-level terminology used in the draft Guidance on the definition and harmonization of the format and structure of Maritime Services within a Maritime Service Portfolio (the draft Guidance), as set out in document NCSR 5/WP.4, annex 2, in particular regarding the use of the terms "Maritime Services" and "Local Port Services".

5.3 During the consideration, while expressing some sympathy to the proposals, the view was expressed that it would be difficult to change the terms proposed as these had already been agreed as part of the *E-navigation Strategy Implementation Plan – update 1* (MSC.1/Circ.1595) and thus, changing the title of "Local Port Services" would also require updating the e-navigation Strategy Implementation Plan (SIP). On the other hand, it was recognized that certain flexibility should be given to the domain coordinating bodies to address these kind of issues and those raised by IHMA could be further elaborated or explained under the description of the corresponding Maritime Service.

5.4 After consideration, the Group agreed not to further discuss the proposals contained in document HGDM 2/4/1 and to refer the issue to NCSR 6. In addition, IHMA was invited to provide a description of Maritime Service 4 to NCSR 6, together with any concerns regarding the title of the Maritime Service.

5.5 In considering document HGDM 2/4/2 (Norway) proposing amendments to the draft Guidance, the Group agreed that:

- .1 document HGDM 2/4/2 should be used as the base document for the review of the draft Guidance;
- .2 consideration should be given to the role of IMO and the descriptions of Maritime Services; and
- .3 it was important to have a clear understanding of the purpose and users of the draft Guidance.

5.6 After consideration, the Chair proposed to proceed with the review of the draft Guidance, as presented in document HGDM 2/4/2, addressing at the same time issues related to the role of IMO, under the respective sections. The Chair further proposed to discuss the cover of the draft resolution, as presented in document NCSR 5/WP.4, annex 2.

Review of the draft guidance on the definition and harmonization of the format and structure of Maritime Services

5.7 The Group reviewed the main body of the draft Guidance, using document HGDM 2/4/2 as a basis, and took a number of decisions, as summarized in the following paragraphs.

Cover of the draft Guidance

5.8 The Group discussed whether the cover of the draft Guidance should be presented as a MSC resolution or as a MSC circular. Recognizing the need to update descriptions of Maritime Services in the future, the Group noted that the process of updating a MSC circular (i.e. by issuing revised versions) could be simpler than updating or amending a MSC resolution.

5.9 After in-depth consideration, the Group agreed to develop, as part of a two-step approach:

- .1 a draft MSC resolution containing the draft Guidance, including the template for the submission of Maritime Services descriptions and guidance for the harmonized specification of technical services, and inviting Member States and international organizations acting as domain coordinating bodies to submit descriptions of Maritime Services to the Organization; and
- .2 a draft MSC circular consolidating the descriptions of Maritime Services, which could be re-issued, as revised versions, when Maritime Services were added or updated.

5.10 Furthermore, the Group agreed to rename the title of the draft Guidance to "Guidance on the definition and harmonization of the format and structure of Maritime Services", excluding the reference to "Maritime Service Portfolio".

Introduction

5.11 The Group agreed to simplify the "Introduction" section by removing a number of paragraphs. The paragraph describing the role of IMO was also redrafted taking into account the contents of the agreed "Strategy for the development and implementation of e-navigation" (MSC 85/26/Add.1, annex 20).

Purpose

5.12 The Group clarified the purpose of the draft Guidance and agreed to include a reference to the MSC circular that would contain the descriptions of Maritime Services.

Application

5.13 The Group agreed that the draft Guidance would be recommended for Member States providing Maritime Services, international organizations acting as domain coordinating bodies and other service providers.

Terminology

5.14 The Group agreed to simplify this section and removed the definitions of terms that would not be used in the draft Guidance (i.e. Maritime Service Portfolio, Common Maritime Data Structure, Operational service and Data Model).

5.15 The Group also agreed to amend the definitions of Maritime Service, Technical Service and S-100 IHO Universal Hydrographic Data Model.

5.16 The Group noted that this would require consequential amendments to the SIP in a future update.

Three levels of responsibility

5.17 The Group agreed to maintain the three levels of responsibility, making some amendments to the text (i.e. IMO for overarching coordination level, international organizations and Member States for the functional and operational level, and Member States and other service providers within Member States for the service level).

Information on technical services

5.18 The Group agreed to delete section 5 on "Information on associated technical services", and add a new section 8 titled "Description of the harmonized specification of technical services", referring to the information in appendix 2, which was also further amended.

Flow chart for the development of a new Maritime Service

5.19 The Group had a lengthy discussion on the future procedures for considering descriptions of Maritime Services to be submitted by Member States and/or international organizations acting as coordinating bodies. In doing so, the Group took into account the method of work of the Organization (MSC-MEPC.1/Circ.5/Rev.1).

5.20 The Group also discussed whether the HGDM should be maintained as a permanent group for the consideration of Maritime Services descriptions and if a continuous output would be required.

5.21 After consideration, the Group agreed to recommend that descriptions of Maritime Services could be submitted to the NCSR Sub-Committee for consideration under either a revised output referring to the "Consideration of descriptions of Maritime Services" or under "Any other business". NCSR could then decide how to address the required work (e.g. by the Sub-Committee itself or one of the Working Groups, or by reactivating the HGDM, subject to the Committee's authorization).

Overarching architecture

5.22 The Group considered a proposal to include a section referring to the overarching architecture agreed under the e-navigation Strategy Implementation Plan (MSC.1/Circ.1595). After some discussion, the Group agreed that the new proposed section should not be included as it was considered not to be relevant.

Relationship between the different levels of service descriptions

5.23 The Group agreed to include a new section on "Relationship between the different levels of service descriptions" illustrating the interactions between service levels.

Relationship between Maritime Services and S-100 based product specifications

5.24 The Group agreed to include a new section describing the relationship between Maritime Services and S-100 based product specifications.

Template for Maritime Service descriptions

5.25 The Group did not find it necessary to make any substantial changes to the template for descriptions of Maritime Services.

Draft MSC resolution

5.26 As instructed, the Group finalized a draft MSC resolution on Guidance on the definition and harmonization of the format and structure of Maritime Services, as set out in annex 1, for the Sub-Committee's approval and subsequent adoption by the Maritime Safety Committee.

6 CONSIDERATION OF DESCRIPTIONS OF MARITIME SERVICES FROM DOMAIN COORDINATING BODIES (AGENDA ITEM 5)

6.1 The Group had for its consideration the following documents:

- .1 HGDM 2/4 (Norway), proposing an initial input for Maritime Services that had not been assigned to a domain coordinating body (i.e. 7 (Tug service), 8 (Vessel Shore Reporting), 9 (Telemedical Assistance Service), 10 (Maritime Assistance Service (MAS)) and 16 (Search and Rescue Service));
- .2 HGDM 2/5 (Sweden), providing information on the Sea Traffic Management (STM) project and recommending that the following information be taken into account as a best practice of a Maritime Service description and its different levels (i.e. description for a Voyage Information Service specification, description for a Voyage Information Service technical design Specification, and description for a Voyage Information Service technical instance description); and
- .3 HGDM 2/5/1/Rev.1 (WMO, IHO, IMPA and IALA), providing draft descriptions for Maritime Services 1 (VTS Information Service (INS)), 2 (Navigational Assistance Service (NAS)), 3 (Traffic Organization Service (TOS)), 5 (Maritime Safety Information Service (MSI)), 6 (Pilotage service), 11 (Nautical Chart Service), 12 (Nautical Publications Service), 13 (Ice Navigation Service), 14

(Meteorological Information Service) and 15 (Real-time hydrographic and environmental information Service).

6.2 The Group noted with appreciation the information provided by domain coordinating bodies and by Member States involved in the preparation of preliminary descriptions of Maritime Services for which no coordinating body had been identified.

6.3 After an initial consideration, the Group, noting that the draft descriptions of Maritime Services submitted were not final descriptions and would require further development, agreed that:

- .1 the descriptions submitted by domain coordinating bodies should not be modified, but rather the Group should raise any concerns regarding harmonization and provide recommendations and advice for further developments;
- .2 it was necessary to undertake a high-level editorial review to ensure consistency with IMO style and use of correct terminology; and
- .3 available descriptions of Maritime Services should be consolidated and published under a MSC circular, which could be subsequently revised, as and when necessary.

6.4 The Group agreed to proceed with the high-level review of Maritime Service descriptions, as presented in documents HGDM 2/4 and HGDM 2/5/1/Rev.1, taking into account the information and comments provided in document HGDM 2/5, and with the view of preparing a draft MSC circular containing the descriptions of Maritime Services.

6.5 The Group also agreed that the cover of the MSC circular should clearly indicate that the descriptions of Maritime Services were preliminary drafts which would be periodically updated taking into account developments and related work on harmonization.

6.6 Based on the information provided, the Group reviewed the descriptions of the following Maritime Services:

- 1 (VTS Information Service (INS));
- 2 (Navigational Assistance Service (NAS));
- 3 (Traffic Organization Service (TOS));
- 5 (Maritime Safety Information Service (MSI));
- 6 (Pilotage service);
- 7 (Tug service);
- 8 (Vessel Shore Reporting);
- 9 (Telemedical Assistance Service);
- 10 (Maritime Assistance Service (MAS));
- 11 (Nautical Chart Service);

- 12 (Nautical Publications Service);
- 13 (Ice Navigation Service);
- 14 (Meteorological Information Service);
- 15 (Real-time hydrographic and environmental information Service); and
- 16 (Search and Rescue Service).

6.7 The Group noted that IHMA would submit a description on Maritime Service 4 (Local Port Service (LPS)) to NCSR 6, including a proposal and justification to rename the Maritime Service. In this context, the observer from IALA supported the change of the title of Maritime Service 4 as the term "LPS" was already in use for other applications and could create confusion. IALA recommended using instead "Port Logistics Service".

6.8 As part of the general comments regarding the descriptions, the Group invited domain coordinating bodies and Member States involved in the preparation of Maritime Service descriptions:

- .1 when defining the associated technical services, to ensure that only Maritime Resource Names (MRNs) that had been accepted as a global harmonized solution were included;
- .2 to complete as much as possible all sections of the template;
- .3 to note that the section "Information to be provided" was not about "how" the information should be provided, but rather to describe "what" information should be provided; and
- .4 to take into account the comments of the Group for future work on the Maritime Services descriptions.

6.9 With regard to the descriptions of Maritime Services 13 (Ice Navigation Service) and 14 (Meteorological Information Service), the Group noted that two new sections were added which did not comply with the template (i.e. format and examples). After some discussion, the Group agreed to delete these two sections and invited the domain coordinating body to consider including relevant information under associated technical services or to include references to relevant guidelines or standards.

6.10 The Group noted that Maritime Service 15 (Real-time hydrographic and environmental information Service) was divided into two sub-services. It was noted that this was necessary in order to make a clear distinction between "Water level information for navigation" and "Surface water currents for navigation".

6.11 In considering the preliminary descriptions of Maritime Services 7 (Tug service), 8 (Vessel Shore Reporting), 9 (Telemedical Assistance Service), 10 (Maritime Assistance Service (MAS)) and 16 (Search and Rescue Service), the Group agreed to undertake a more substantial revision, as these were prepared by a Member State in the absence of any domain coordinating body. The Group also agreed to refer, for the time being, to the submitter Member State under "Submitting Organization" until a domain coordinating body was identified. In this context, the Group invited

interested international organizations to consider acting as domain coordinating bodies for these Maritime Services.

6.12 During the discussions related to Maritime Service 8 (Vessel Shore Reporting), the following views were expressed:

- .1 given the reporting obligations under the FAL Convention, SOLAS chapter V and other SAR-related reporting requirements, the Maritime Service could be divided into sub-services;
- .2 the purpose of this service was to inform the mariner about reporting formalities, so it would be better to keep it as a single Maritime Service;
- .3 IMO should be the coordinating body of this service; and
- .4 involvement of the FAL Committee should also be considered.

6.13 After consideration, the Group agreed to keep the description of Maritime Service 8 in square brackets and to invite the Sub-Committee to consider the best approach to be taken.

Draft MSC circular

6.14 The Group prepared a draft MSC circular, as set out in annex 2, containing the first draft of Maritime Service descriptions, with the view to finalization at NCSR 6 and approval.

6.15 The Group authorized the Secretariat, when finalizing the report of the Group to NCSR 6, to review the descriptions of Maritime Services and make any further editorial corrections/improvements in line with IMO practices.

7 CONSIDERATION OF THE ROLE OF THE ORGANIZATION IN EXERCISING ITS LEADERSHIP IN THE HARMONIZATION OF DIGITALIZED MARITIME SERVICES (AGENDA ITEM 6)

7.1 The Group noted that the role of the Organization had been discussed under agenda item 4 and relevant paragraphs were included in the draft MSC resolution.

8 DEVELOPMENT OF A PRELIMINARY FLOW CHART FOR THE HARMONIZATION OF MARITIME SERVICES (AGENDA ITEM 7)

8.1 The Group noted that the flow chart for the harmonization of Maritime Services was discussed under agenda item 4 (paragraphs 5.19 to 5.21) and that a relevant section was included in the draft MSC resolution.

9 CONSIDERATION OF THE EXPECTED ADDITIONAL WORKLOAD FOR THE SUB-COMMITTEE AND THE SECRETARIAT (AGENDA ITEM 8)

9.1 Given the need for a continuous review process of Maritime Service descriptions and the harmonization of related services, the Group invited the Sub-Committee to consider the following options for the review of descriptions of Maritime Services:

- .1 rename the existing output for the development of Guidance to "Consideration of descriptions of Maritime Services"; or
- .2 consider the descriptions of Maritime Services, and relevant updates, submitted by domain coordinating bodies and Member States involved in the preparation of Maritime Services under "Any other business".

10 ANY OTHER BUSINESS (AGENDA ITEM 9)

10.1 No other issues were discussed under this agenda item.

11 REPORT TO NCSR 6 AND IHO (AGENDA ITEM 10)

11.1 The Group invited the NCSR Sub-Committee to note the report in general and, in particular, to:

- .1 agree with the proposed two-step approach for the definition and harmonization of the format and structure of Maritime Services (paragraphs 5.8 and 5.9):
 - .1 a MSC resolution containing the draft Guidance on the definition and harmonization of the format and structure of Maritime Services, including the template for the submission of Maritime Services descriptions and guidance for the harmonized specification of technical services, and inviting Member States and international organizations acting as domain coordinating bodies to submit descriptions of Maritime Services to the Organization; and
 - .2 a MSC circular consolidating the descriptions of Maritime Services, which could be re-issued, as revised versions, when Maritime Services were added or updated;
- .2 agree to rename the guidance to "Guidance on the definition and harmonization of the format and structure of Maritime Services" (paragraph 5.10);
- .3 approve, for submission to the Committee, the draft MSC resolution on Guidance on the definition and harmonization of the format and structure of Maritime Services (paragraph 5.26 and annex 1);
- .4 consider, with the view to finalization and approval, the draft MSC circular on Descriptions of Maritime Service, including, in particular, the description and title of Maritime Service 4 "Local Port Services" and the description of Maritime Service 8 "Vessel Shore Reporting" (paragraphs 6.1 to 6.14 and annex 2); and
- .5 in order to enable the continuous review process of Maritime Service descriptions and the harmonization of related services, consider whether to (paragraph 9.1):
 - .1 rename the existing output for the development of Guidance to "Consideration of descriptions of Maritime Services"; or

- .2 consider the descriptions of Maritime Services, and relevant updates, submitted by domain coordinating bodies and Member States involved in the preparation of Maritime Services under "Any other business".

ANNEX 1

DRAFT MSC RESOLUTION

**GUIDANCE ON THE DEFINITION AND HARMONIZATION OF THE FORMAT
AND STRUCTURE OF MARITIME SERVICES**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO the *E-navigation Strategy Implementation Plan – update 1* (MSC.1/Circ.1595) approved by it, in particular, the need to harmonize the exchange of maritime-related information and data to enhance berth to berth navigation and related services for safety of navigation and security at sea and protection of the marine environment,

NOTING the available Maritime Services which provide and/or exchange maritime information and data with shipping related, but not limited to, vessel traffic service information, navigational assistance, traffic organization, maritime safety information, pilotage, tugs, vessel shore reporting, telemedical assistance, local port information, nautical charts and publications, ice navigation, meteorological, hydrographic and environmental information, search and rescue and other Maritime Services that may be developed and implemented in the future,

RECOGNIZING the responsibilities of the Organization and other international organizations, such as the International Hydrographic Organization (IHO), the World Meteorological Organization (WMO), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the International Maritime Pilots Association (IMPA) and the International Harbour Masters Association (IHMA), amongst others, in defining specific services under their respective domains, including technical and product specifications, standards, guidelines and recommendations,

RECOGNIZING ALSO the need to harmonize the format and structure of Maritime Services and the maritime-related information and data provided by them in order to enhance the safety and efficiency of shipping,

RECOGNIZING FURTHER the need to work in collaboration with all involved international organizations in order to harmonize the exchange of maritime information and data provided through different Maritime Services,

NOTING the willingness of international organizations to act as domain coordinating bodies for Maritime Services under their respective domains, in collaboration with other relevant stakeholders,

HAVING CONSIDERED, at its [...] session, the recommendation made by the Sub-Committee on Navigation, Communications and Search and Rescue, at its [sixth] session,

1 ADOPTS the Guidance on the definition and harmonization of the format and structure of Maritime Services, set out in the annex to the present resolution;

2 AGREES 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;

3 INVITES Member States and international organizations acting as domain coordinating bodies to submit descriptions of Maritime Services to the Organization, taking into account the present guidance.

ANNEX

GUIDANCE ON THE DEFINITION AND HARMONIZATION OF THE FORMAT AND STRUCTURE OF MARITIME SERVICES

1 Introduction

1.1 Modern shipping relies on a large amount of data and information to safely navigate from berth to berth. A very important set of information is promulgated as maritime safety information (MSI), as defined in resolution A.705(17), as amended, on *Promulgation of maritime safety information (MSI)* and MSC.1/Circ.1310/Rev.1 on *Revised Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI)*. MSI includes navigational warnings, meteorological information and other urgent safety-related information. In addition to being safety-relevant, marine information services are used for optimizing voyage routes, which can include the best passage through ice, a security-risk area or avoiding the known path of marine mammals. Route optimization may also include taking advantage of favourable winds and currents and engine loads may be adjusted accordingly.

1.2 To assess the dynamic effects mentioned above, the ship's bridge team needs up to date information for the ship's planned operation. The information flow also comprises ship-to-shore communications, particularly prior to entering the coastal waters of a State, a ship is usually requested to provide details of her voyage, cargo, crew and passengers on board, advising on the next port of call and other information. Shore-to-ship, ship-to-ship, ship-to-shore and shore-to-shore information exchange enable new services and technologies to improve safety and efficiency of shipping. All those marine information services, as referred to in the e-navigation Strategy Implementation Plan (SIP) as Maritime Services (MSC.1/Circ.1595, as may be revised), are being considered to be transitioned from conventional transmission methods to contemporary digital technologies.

1.3 The *Strategy for the development and implementation of e-navigation* (MSC 85/26/Add.1, annex 20) assigns the governance of the e-navigation concept to the IMO as the organization responsible for establishing mandatory standards for enhancing the safety of life at sea, maritime security and protection of the marine environment, as well as having global remit.

2 Purpose

2.1 The purpose of this Guidance is to ensure that Maritime Services are implemented internationally in a standardized and harmonized format. To support this purpose, a template to describe Maritime Services is provided in appendix 1 and descriptions of Maritime Services are consolidated under MSC.1/Circ.[...].

2.2 The SIP requires that all Maritime Services be S-100 conformant as a baseline. The International Hydrographic Organization (IHO) S-100 framework standard specifies the method for data modelling and developing product specifications.

3 Application

3.1 This Guidance is recommended for Member States providing Maritime Services, international organizations acting as domain coordinating bodies and other service providers.

4 Terminology

4.1 For the purpose of the Guidance, unless expressly provided otherwise:

- .1 *Maritime Service* refers to the provision and exchange of maritime-related information and data in a harmonized, unified format.
- .2 *Technical Service* comprises a set of technical solutions including data model and communications means to provide a Maritime Service.
- .3 *S-100 IHO Universal Hydrographic Data Model* is a standard that makes provision for the development of data models and associated product specifications.

5 Three levels of responsibility

Overarching coordination level

5.1 IMO, in its role as leading e-navigation development, is responsible for guiding the establishment and harmonization of information and data transfers relating to Maritime Services. This includes providing leadership to harmonize Maritime Services through the provision of guidance.

Functional and operational level

5.2 International organizations and Member States propose the description of specific Maritime Services, using the template as provided in appendix 1, to the Organization and manage and maintain the agreed description through harmonized operational and technical specifications.

5.3 International organizations as domain coordinating bodies, such as the IHO, WMO, IALA and others, provide guidelines to stakeholders and domain management. This should include description of current and future Maritime Services and identification and specification of associated technical services.

5.4 When domain coordinating bodies for Maritime Services are unknown or may not exist, descriptions and specifications derived from other Maritime Services may assist with harmonizing technical specifications.

Service level

5.5 Member States and other service providers within Member States (e.g. port authorities, Hydrographic Offices, SAR services, etc.) are responsible for the provision of Maritime Services.

6 Flow chart for the development of a new Maritime Service

6.1 Figure 1 reflects a recommended process of steps to be followed for the development of a new Maritime Service.

6.2 The domain coordinating bodies and Member States should submit the descriptions of Maritime Services, using the template in appendix 1, to the Organization (1).

6.3 Descriptions of Maritime Services should contain references to relevant international standards, recommendations and guidelines which may contain criteria for the implementation of these Maritime Services, as well as identified user requirements for data and information (2).

6.4 The assigned IMO body should consider the submitted descriptions of Maritime Services (3) and decide, as appropriate, the steps needed to resolve any issues and agree to update the relevant IMO instrument (4).

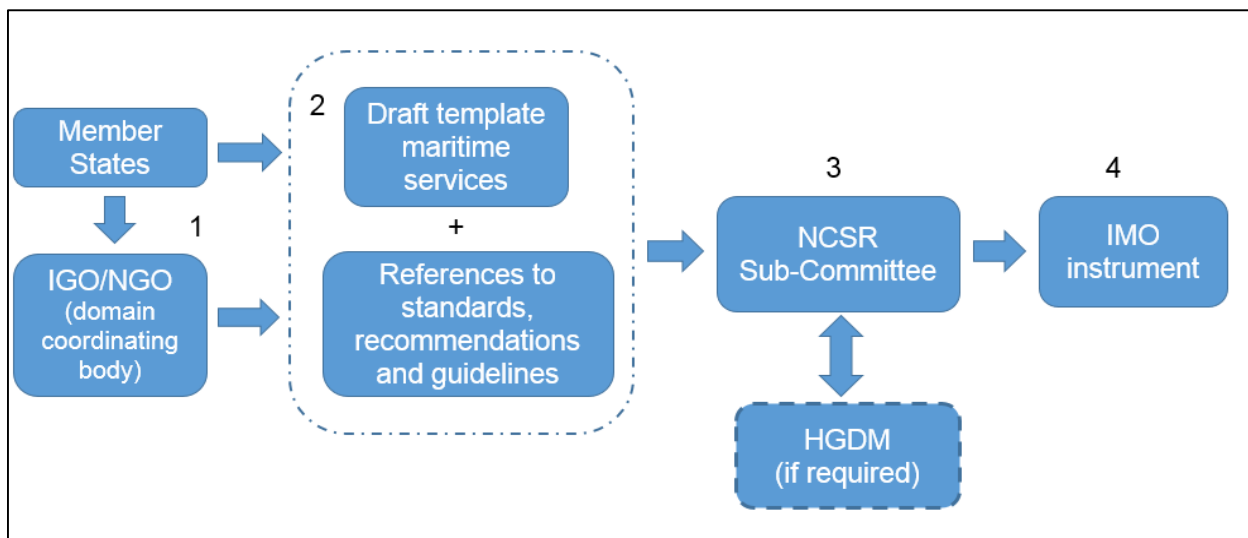


Figure 1: Recommended process for the development of Maritime Services

7 Relationship between the different levels of service descriptions

7.1 Figure 1 illustrates the interactions between service levels.

7.2 The description in the template reflects a common understanding and definition of a Maritime Service. This safeguards the harmonization of the information needed as decision support based on the user needs and operational requirements. The information could be presented on a graphical display on board in accordance with e-navigation solution 4 (see MSC.1/Circ.1595, as may be revised). The harmonized development of S-100 based specifications aims at ensuring user-friendliness for all relevant stakeholders in receiving and using the information in addition to enable the industry to develop systems based on the same data language.

7.3 Technical services are needed to coordinate a seamless combination between different product specifications. Information provided using S-100 based product specifications is brought together by technical services to deliver a Maritime Service.

7.4 Digital information regarding, for instance a restricted area, will combine several attributes from a set of S-100 products to provide the navigator with a complete information picture.

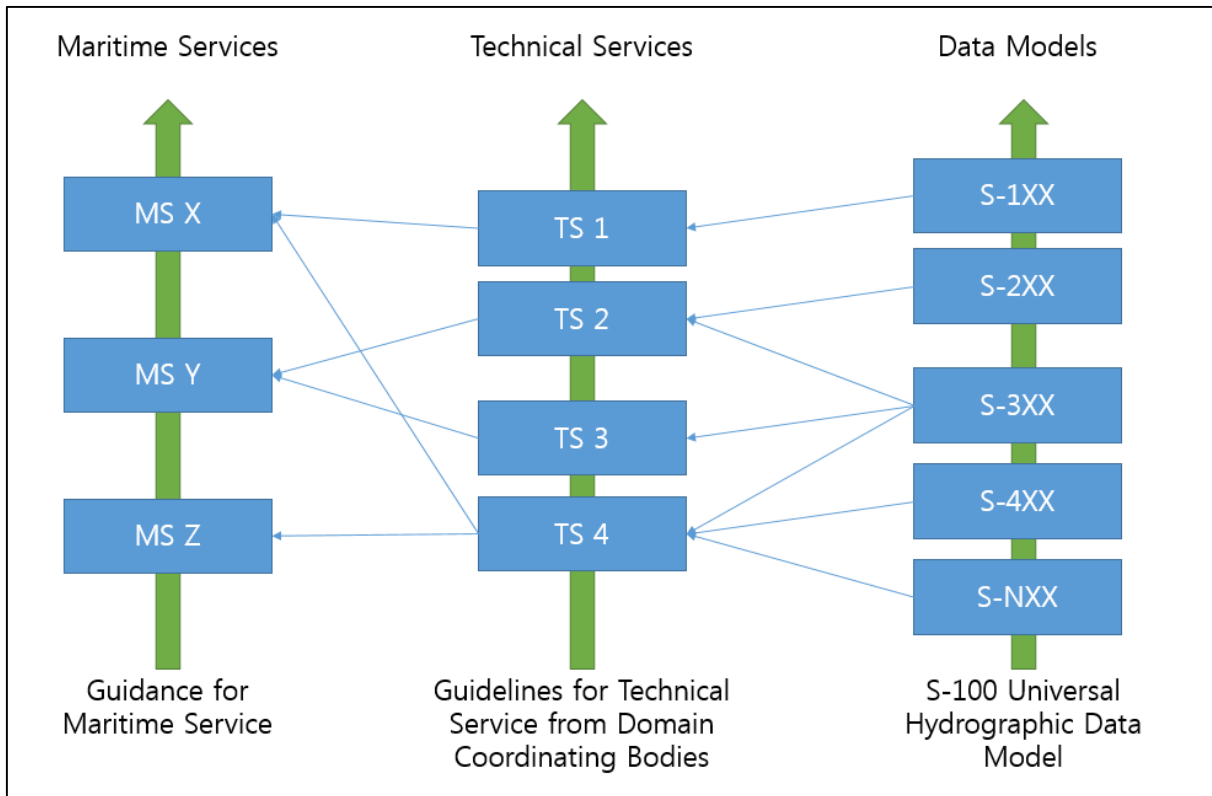


Figure 2: Interaction between different service levels

8 Description for the harmonized specification of technical services

8.1 Maritime Services are described by using a common template, as set out in appendix 1. This template includes references to relevant technical services.

8.2 The interoperability of technical services is ensured by a coordinated approach of the domain coordinating bodies to define needed communication means and data models.

8.3 Technical services should follow the appropriate guidance and product specification developed by the appropriate domain coordinating body and, where appropriate, be based on the S-100 framework with associated S-XXX product specifications.

8.4 Appendix 2 provides a description for the harmonized specification of technical services.

9 Relationship between Maritime Service and S-100 based product specification

9.1 Some Maritime Services and their associated technical services may rely on information from multiple S-100 based products. In cases where information is produced by different domain stakeholders, care should be taken to ensure compatibility at both the feature/attribute and data products levels.

9.2 The IHO GI Registry is the mechanism to ensure consistency in the way that different stakeholder communities model real world concepts and define them as features/attribute combinations. To ensure complete service provision, stakeholders should consult the IHO GI Registry, in particular the Feature Data Dictionary and the testbed registers.

Appendix 1

Template for descriptions of Maritime Services

This template should be used to describe Maritime Services. Descriptions of Maritime Services provided to IMO using this template will enable IMO to exercise leadership and overarching oversight and to provide a globally harmonized list of Maritime Services.

To ensure a standardized approach in the development and implementation of Maritime Services, the content should include a general description of the operational services, and a reference to associated technical services that will enable the exchange of information in digital format:

1. Title of the Maritime Service (Maritime Service number)

2. Submitting Organization

3. Description of the Maritime Service

Stating the exact nature and scope of the Maritime Service in accordance, if applicable, with existing IMO instruments. Additional details might be added for clarity as required.

4. Purpose

What is the purpose of the Maritime Service?

What value does it bring to its intended stakeholders?

Is the Maritime Service compliant with regulatory requirements, if applicable?

In the case that the Maritime Service covers existing services, a description of the steps required to transition from analogue to digital information promulgation must be included.

5. Operational approach

How is the purpose of the Maritime Service achieved, taking into account existing guidance of the Organization and other international bodies?

6. User needs

Describe the user needs the Maritime Service addresses. In so doing make reference to any relevant IMO instruments and, where applicable, include one or more use cases.

7. Information to be provided

List the information elements the Maritime Service provides. The information elements will be the starting point for data modelling, as part of the technical services to access, promulgate or exchange the information.

8. Associated technical services

Using the table below list existing or potential technical services associated with this Maritime Service.

Name	ID (MRN) *	Description (incl. measure for quality assurance [‡])	Standardization body

9. Relation to other Maritime Services

Describe any relationships between this and other Maritime Services such as interdependencies or areas of overlap. This section should clarify the nature of interdependencies, overlaps and provide recommendations for their resolution.

* Maritime Resource Name (MRN); see <http://mrnregistry.org>.

‡ MSC.1/Circ.1512 on *Guideline on software quality assurance and human-centred design for e-navigation* or others, as appropriate.

Appendix 2

Description for the harmonized specification of technical services

1 Maritime Services are implemented by a set of Technical Services. For harmonization, the Maritime Services are described by using a common template, as set out in appendix 1. This template includes references to technical services.

2 The specifications are split into three parts:

- a service specification;
- a service design description; and
- a service instance description.

3 The technical service specification covers the technical/digital service on a general level to implement the Maritime Services. The service specification is still technology-agnostic. The service specification should include the following information:

- MRN ID for the service specification;
- reference to the Maritime Services which make usage of the Technical Services;
- the operational context of the service in (e.g. requirements, use cases);
- the service interface descriptions (operations, parameters);
- the information provided and used by the service (the service data model);
- the dynamic behaviour of the service (sequence of operations, behaviour description); and
- author of the service specification (organization, contact person).

4 A technical service specification will have one or several associated (technical) service design descriptions. Each technical design describes how the service is implemented using specific technologies. Service design descriptions should include the following information:

- MRN ID for the service design description;
- reference to the service specification;
- description of the chosen technologies (data processing, communication technologies, infrastructure, networks, etc.);
- detailed description of the used data structures and types (service physical data model, encoding);
- mapping of the used data structures to the service specification's service data model; and
- author of the technical design (organization, contact person).

5 A technical service design will have one or several associated technical service instance descriptions. Each instance description is a reference (endpoint) to a specific service provider for this specific service following the specific design description. The instance description also contains additional information such as coverage area for the service providers' instance of the service. A service instance includes the following information:

- MRN ID for the service instance description;
- reference to the service technical design (and thus, implicitly, to the service specification);
- information about service provider;
- access/information (e.g. URL, frequencies etc.); and
- geographical coverage information.

6 The relationship between the different levels of service descriptions are shown in this example for a VTS service:

Maritime Service	Technical Service specification	Technical service design description	Technical service instance description
VTS service	Inter VTS information exchange	Web service using REST	Provided by Sound VTS
			Provided by Helsinki VTS
		Web service using SOAP	Provided by Zandvliet VTS
		Other technical design for VTS information exchange	Another instance of that design provided by someone somewhere
	Route exchange ship to shore	Some technical design	Some instance
		Another design	Another instance
Another technical VTS service	
Another Maritime service
...

7 In order to achieve a harmonised use of technical services, it is recommended to use guidelines developed by the domain coordinating bodies¹, if available.

¹ E.g. IALA Guideline G1128.

ANNEX 2

DRAFT MSC CIRCULAR

DESCRIPTIONS OF MARITIME SERVICES

1 The Maritime Safety Committee, at its [...] session, adopted resolution MSC.[...] on *Guidance on the definition and harmonization of the format and structure of Maritime Services*, 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 the Descriptions of Maritime Services, set out in the annex, which had been prepared by the Sub-Committee on Navigation, Communications and Search and Rescue, at its [sixth] session (...), based on information submitted by Member States or international organizations acting as domain coordinating bodies.

3 The information contained in the annex constitutes the first draft of Maritime Service descriptions and is an initial contribution for the harmonization of the format and structure of Maritime Services. Descriptions of Maritime Services are expected to be periodically updated, taking into account developments and related work on harmonization.

4 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.

5 Member States and international organizations are invited to bring the present circular to the attention of those responsible for the development or implementation of Maritime Services.

ANNEX

MARITIME SERVICES DESCRIPTIONS

MS 1 - VTS Information Service (INS)

1.1 Submitting Organization

IALA

1.2 Description of the Maritime Service

IALA Guideline 1089 on *Provision of Vessel Traffic Services (INS, TOS, NAS)* provides guidance on the delivery of the three different types of services provided by a Vessel Traffic Service (VTS): Information Service (INS), Traffic Organization Service (TOS) and Navigational Assistance Service (NAS).

According to resolution A.857(20) on *Guidelines for Vessel Traffic Services*, an information service provided by a VTS is defined as "a service to ensure that essential information becomes available in time for on-board navigational decision-making."

Resolution A.857(20) also states that "the *information service* is provided by broadcasting information at fixed times and intervals or when deemed necessary by the VTS or at the request of a vessel, and may include for example reports on the position, identity and intentions of other traffic, waterway conditions, weather, hazards, or any other factors that may influence the vessel's transit."

Information related to:	Examples:
Navigational situations (including traffic and route information)	<ul style="list-style-type: none">• Position, identity, destination of vessels and the intention of other traffic.• Amendments and changes in promulgated information concerning the VTS area such as boundaries, procedures, radio frequencies, reporting points, the mandatory reporting of movements.• Limited manoeuvrability that may impose restrictions on the navigation of other vessels, or any other potential hindrances.• Suspension or change of routes, etc.
Navigational warnings	<ul style="list-style-type: none">• Dangerous wrecks, obstacles not otherwise promulgated, diving operations, vessels not under command, etc.
Meteorology	<ul style="list-style-type: none">• Information that will include the speed and direction of the prevailing wind, direction and height of the waves, visibility, atmospheric pressure, the formation of ice, etc.
Meteorological warnings	<ul style="list-style-type: none">• Gale, storm, tsunami, restricted visibility, etc.
Hydrography	<ul style="list-style-type: none">• Information that will include factors such as the stability of the seabed, sea depth, the accuracy of surveys, tidal ranges, tidal streams, prevailing currents and swell, etc.

Information related to:	Examples:
Electronic navigational aids	<ul style="list-style-type: none"> The availability of electronic navigational aids such as GNSS, Loran, DGPS, AIS, RACON, etc.
Other information	<ul style="list-style-type: none"> Port information, pilot or tug request, cargo information, health condition, PSC, ISPS, etc.

Table 1-1: Examples of the types of information that may be provided by the VTS operating an Information Service (IALA Guideline 1089)

1.3 Purpose

The purpose of this Maritime Service is to provide data in a digital format to support VTS Information Service (INS) and to create the means to reduce administrative burden and information overload, reduce miscommunication due to external interference, simplify work procedures, promote sustainable shipping and increase navigational safety.

Information provided in a digital format could complement and/or replace verbal/voice communications. 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 authority.

1.4 Operational approach

The digitalization of information will diversify the communication means between shore authorities and vessels and will affect VTS procedures regarding provision of information.

Not all vessels are capable of receiving information in digital format. Provisions should, therefore, be made to ensure that less capable vessels are receiving the information they require. VTS should remain the primary contact with vessels for urgent and important messages and to ensure communications with mariners.

1.5 User needs

Resolution A.857(20) contains examples of information that can be provided to vessels. The use case below is based on the information from table 1-1.

Use case: Vessel arrival

Before or upon arrival in the VTS area, a data collection system on board sends all details regarding the arrival via relevant infrastructure to the VTS. The VTS collects the vessel's data directly into its system and automatically updates the vessel's pre-registered data. Both the vessel and the VTS use chart systems as a graphic interface to present details that are of interest to the voyage.

This example is generic and is intended for description purposes only. Actions and template categories may differ for different countries. Information exchange can be in real time instead of at specific times as indicated in the table below.

Time	Automated Vessel Action	Automated VTS Action	Information category
01:00	Provides pre-arrival information	Replying with information on weather	Environmental
02:00	Enters VTS area, provides sailing route	Traffic information to vessel	Traffic and Route information
02:30	Passes reporting point line	Provides information on current, wave height, etc.	Hydrographical information
03:00	Requires port information	Provides quay details	Traffic and Route information
03:30	Passes second reporting point	Provides operational information on AtoNs	Navigation Hazards
04:00	Vessel along side	Gives information on wind speeds, visibility	Environmental

1.6 Information to be provided

(More to come).

1.7 Associated technical services

Name	ID (MRN)	Description	Standardization Body
Voyage Information Service	urn:mrn:stm:service:specification:sma:vis	The service supports exchange of voyage plans, text messages and area messages.	IEC
Weather Service			
ENSI Voyage Reporting Service	urn:mrn:mcp:service:specification:fta:ENSI-VRS	The Service provides route validation for ships and facilitates sharing of SRS reports and Voyage information to shore centres.	
Routeing information	urn:mrn:iho:s127	S-127	IHO
Currents Service	urn:mrn:iho:s101	S-101	IHO
Wave height service			

Port information (harbour charting information)	urn:mrn:iho:s101	S-101	IHO
Port information (harbour services information)			IHMA
AtoN Information	urn:mrn:iala:aton		IALA

1.8 Relationship to other Maritime Services

MS 1 has a relationship with other Maritime Services where it affects the VTS.

Examples may be different depending on coastal State arrangements.

Description	Examples of data that could be of interest for MS 1
MS 2 VTS NAS	(More to come)
MS 3 VTS TOS	(More to come)
MS 4 Local Port Service	Delays, obstruction, cargo operations, port availability and anchorage area in the port, ISPS state, Marsec level
MS 5 Maritime Safety Information	All information depending on structure of MSI
MS 6 Pilotage Service	Pilot orders and updates
MS 7 Tug Service	Tug order and updates
MS 8 Vessel Shore Reporting	Notification of arrival, dangerous cargo etc.
MS 9 Telemedical	Delays
MS 10 Maritime Assistance Service	Notifications, routeing, places of refuge
MS 11 Nautical Chart Service	Local Area updates, chart updates
MS 12 Nautical Publication Service	Updates to publication
MS 13 Ice Navigation Service	Ice routes, ice conditions, ice breaking assistance
MS 14 Meteorological Service	
MS 15 Real-Time Hydrographic 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 2 - VTS Navigational Assistance Service (NAS)

2.1 Submitting Organization

IALA

2.2 Description of the Maritime Service

IALA Guideline 1089 on *Provision of Vessel Traffic Services (INS, TOS, NAS)* provides guidance on the delivery of the three different types of services provided by a Vessel Traffic Service (VTS): Information Service (INS), Traffic Organization Service (TOS) and Navigational Assistance Service (NAS).

According to resolution A.857(20) on *Guidelines for Vessel Traffic Services*, a navigational assistance service is defined as "a service to assist on-board navigational decision-making and to monitor its effects."

Resolution A.857(20) also states that "the *navigational assistance service* is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies. This service is normally rendered at the request of a vessel or by the VTS when deemed necessary."

Information related to:	Examples:
Request and identification	<ul style="list-style-type: none"> • Availability of NAS, start and end of NAS. • Request for vessel identification such as position, course made good and speed over the ground. • Status of vessel's equipment; etc.
Navigational information (including position and course information)	<ul style="list-style-type: none"> • Examples provided to an individual vessel: <ul style="list-style-type: none"> • provide range and bearing from fixed objects, fairway/channel or way-points; proximity to navigational hazards, etc. • provide information related to navigating into a channel/fairway/lane (i.e. track is parallel/diverging/converging with/from/to reference line); etc.
Advice (or instruction)	<ul style="list-style-type: none"> • Advise (or instruct) a vessel to alter the course, speed. • Advise (or instruct) to keep clear from area/position, close up/drop back on/from vessels; etc.
Warning	Diverging from the recommended track towards dangerous wrecks, obstacles not otherwise promulgated; diving operations; vessels not under command; etc.

Table 2-1: Examples of the types of information that may be provided by a VTS operating a Navigational Assistance Service (IALA Guideline 1089)

2.3 Purpose

The purpose of this Maritime Service is to provide data in a digital format to support Navigational Assistance Service (NAS) and to create means to reduce administrative burden and information overload, reduce the risk for miscommunication due to external interference, simplify work procedures, promote sustainable shipping, and increase navigational safety.

Information provided in a digital format could complement and/or replace verbal/voice communications. 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 authority.

2.4 Operational approach

All information related to MS 2 should be delivered only by VTS authorities.

VTS should remain the primary contact with vessels for urgent and important messages necessary for on-board decision making.

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

Note: Example of time critical situation:

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

Note: Example of non-time critical situation:

Assist a vessel to an anchoring position by providing the vessel with an electronic route recommendation without voice communications.

The identity of the vessel receiving Navigational Assistance Service should be assured. Other items listed in IALA Guideline 1089 on *Provision of Vessel Traffic Service* (Appendix B) should also be taken into consideration for digital transmission of information.

All information related to this service should be displayed in real time. Measures should be taken to ensure that the information is received and acknowledged.

2.5 User needs

The use cases are generic and intended for description purposes only. Actions and template categories may differ for different countries.

For example:

- Recommended route can be sent digitally to a vessel.

- Pre-arrival reporting can be done digitally without voice communication for update of route of voyage plan in order to avoid collisions, allisions and groundings and assist in safe navigation.
- The content of the voice communication can be provided digitally and be displayed as text in parallel / in addition to voice communication.

Use case: Vessel deviates from planned route

A vessel approaches the VTS area according to the voyage plan sent to the VTS. The route is displayed in the VTS application and vessel's positions are automatically compared to the planned route. The system alerts the VTS operator, who then confirms that the vessel has deviated from its route. The VTS operator informs, warns and, if necessary, instructs / advises the vessel to change its course via voice communication. Navigational assistance information is also presented on the vessel's own navigation system. The VTS operator ensures that the vessel has changed its course according to the solution. The VTS application continues to monitor the vessel's voyage. It will alert the VTS operator if new deviation occurs.

The example is generic and intended for description purposes only. Actions and template categories may differ for different countries.

Time	Vessel Action	VTS Action	Information category
01:00	Approaches VTS area	Receive voyage plan and monitor vessels progress	Traffic and Route Information
01:30	Deviates from the route	Informs, warns and advises / instructs the vessel to change course/speed	Navigational advice
01:35	Changes course	Verifies that the vessel has changed course and is no longer in danger	

Use case: Assistance to a vessel to an anchoring position

A vessel is inside the VTS area and needs to stop for engine repair. The vessel asks for a safe anchorage position. The VTS provides anchoring position. The vessel takes a direct course to the anchoring position, over a shallow area. The VTS gives warning to the vessel and provides a safe route to anchorage position.

After the vessel has anchored, high winds develop causing the vessel to drag anchor. The VTS operator monitoring the anchorage receives an alarm and warns the vessel through automated digital alert and through voice communication.

Time	Vessel Action	VTS Action	Information category
00:00	Ask for anchorage position	Provides position	Navigation Information
00:10	Takes course to the position	Warning: You are running into danger - shallow waters... Provides vessel safe route	Navigational warning / Advice
00:20	Follows route provided by VTS to the anchorage	Monitors	Navigational Information
05:00	Drags anchor	Warning: You are dragging anchor	Navigational warning
05:30	Repositions	Monitors	Navigational Information

2.6 information to be provided

(More to come).

2.7 Associated technical services

Name	ID (MRN)	Description	Standardization Body
Voyage Information Service	urn:mrn:stm:service:specification:sma:vis	The service supports exchange of voyage plans, text messages and area messages.	IEC
Route information		S-421	IEC

2.8 Relationship to other Maritime Services

MS 2 has a relationship to other Maritime services where it affects VTS.

Examples may be different depending on the coastal State arrangements.

Description	Examples of data that could be of interest for MS 2
MS 1 VTS INS	(More to come)
MS 3 VTS TOS	(More to come)
MS 4 Local Port Service	Delays, obstruction, cargo operations, port availability and anchorage area in the port, ISPS state, Marsec level
MS 5 Maritime Safety Information	All information depending on structure of MSI
MS 6 Pilotage Service	Pilot orders and updates
MS 7 Tug Service	Tug order and updates
MS 8 Vessel Shore Reporting	Notification of arrival, dangerous cargo etc.

MS 9 Telemedical	Delays
MS 10 Maritime Assistance Service	Notifications, routeing, places of refuge
MS 11 Nautical Chart Service	Local Area updates, chart updates
MS 12 Nautical Publication Service	Updates to publication
MS 13 Ice Navigation Service	Ice routes, ice conditions, ice breaking assistance
MS 14 Meteorological Service	Weather information
MS 15 Real-Time Hydrographic and Environmental Information Service	Horizontal and vertical tidal information in VTS area, available water column
MS 16 Search and Rescue service	Search pattern and vessels of opportunity

MS 3 - Traffic Organization Service (TOS)

3.1 Submitting Organization

IALA

3.2 Description of the Maritime Service

IALA Guideline 1089 on *Provision of Vessel Traffic Services (INS, TOS, NAS)* provides guidance on the delivery of the three different types of services provided by a Vessel Traffic Service (VTS): Information Service (INS), Traffic Organization Service (TOS) and Navigational Assistance Service (NAS).

According to resolution A.857(20) on *Guidelines for Vessel Traffic Services*, a traffic organization service is defined as "a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS area."

Resolution A.857(20) also states that "the *traffic organization service* concerns the operational management of traffic and the forward planning of vessels movements to prevent congestion and dangerous situations, and is particularly relevant in times of high traffic density or when the movement of special transports may affect the flow of other traffic. The service may also include establishing and operating a system of traffic clearances or VTS sailing plans or both in relation to priority of movements, allocation of space, mandatory reporting of movements in the VTS area, routes to be followed, speed limits to be observed or other appropriate measures which are considered necessary by the VTS authority."

Information related to:	Examples
Traffic clearance	<p>Give authorization under conditional circumstances to a vessel prior to or when entering a VTS area:</p> <ul style="list-style-type: none"> • departing from a berth or an anchorage position within a VTS area; • entering into a fairway within a VTS area; or • prior to commencing a manoeuvre that may be detrimental to safe navigation. <p>Examples of conditions:</p> <ul style="list-style-type: none"> • a VTS sailing plan before entering a VTS area; • lock and bridge passage planning; • report position at determined reporting point/line/pilot station; • use a second fairway in case of bad visibility/weather; • use a tug boat in case of strong wind; • dredging or compass swing in confined waterway.
Anchorage	<p>Examples of anchorage situations:</p> <ul style="list-style-type: none"> • organizing the movements to/from an anchorage position/area; • assignment of an anchorage position; • assisting vessels into anchorage position.

Enforcement	<p>Examples of enforcement:</p> <ul style="list-style-type: none"> • speed limits; • adherence to rules regarding traffic routing measures; • pilotage requirements; • other traffic regulations and possibly local by-laws.
Waterway (sea, channels and fairway) management	<p>Examples of management measures:</p> <ul style="list-style-type: none"> • the use of one-way traffic as an alternative of two way traffic, depending on the dimensions of vessel or the weather conditions; • organizing other traffic when a vessel has passed point of no return; • slot management to allocate vessels in a time window; • organizing the traffic concerning vessel dimensions in comparison to fairway restrictions; • instruct vessels when overtaking is not permitted; • establish and organize vessel safety zones in case of particular operations; • establish and organize exclusion zones; • instruct vessels to keep clear from special areas/positions; • organizing the traffic with regards to meteorological, hydrographical or other restrictions such as visibility, wind speed, current, sea state and under keel clearance.

Table 3-1: Examples of types of information that may be provided by the VTS within a Traffic Organization Service (IALA Guideline 1089)

3.3 Purpose

The purpose of this Maritime Service is to provide data in a digital format to support Traffic Organization Service (TOS) and to create means to reduce administrative burden and information overload, reduce the risk for miscommunication due to external interference, simplify work procedures, promote sustainable shipping, and increase navigational safety.

Information provided in a digital format could complement and/or replace verbal/voice communications. 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 authority.

3.4 Operational approach

A Traffic Organization Service should be responsible for separating traffic in the interest of safety and efficiency. This separation could be defined in space, time and/or distance.

Enforcement may also be carried out within a Traffic Organization Service where the VTS should monitor adherence to applicable rules and regulations and to take appropriate action where required and within the authority of the VTS (IALA Guideline 1089 on *Provision of Vessel Traffic Services*).

Digital communication may apply to elements of the Traffic Organization Service that are not time critical situations.

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.
- Route information: provides vessels digitally with recommended route information.
- Traffic information: vessel provides VTS digitally their intentions, such as overtaking of another vessel.
- Information regarding restricted or no-go area: the content (draft, closed fairway/port/quay etc.) can be provided digitally to vessels without using voice communication.

All information provided digitally can complement and/or replace verbal/voice communications.

3.5 User needs

The use cases are generic and are intended for description purposes only. Actions and template categories may differ for different countries.

Use case: Vessel leaves quay

When the vessel is ready to sail, it sends its planned time of departure digitally to the VTS where it is presented in the VTS application. The application alerts operator on upcoming traffic conflicts and advises on a solution, which is assessed by the VTS. The VTS operator takes action and digitally instructs the vessel to delay planned departure by thirty minutes. The instructions are graphically displayed in applications, acknowledged by the vessel and the VTS operator provides delayed departure information to other traffic via digital and/or verbal means for vessels not able to receive information digitally.

Time	Vessel action	VTS action	Information category
00:00	Sends ETD to the VTS and requests permission to leave quay (in some cases additional communication by voice could be required).	Denies clearance. Gives permission to leave in thirty minutes	Waterway management
00:01	The vessel acknowledges revised ETD	VTS receives acknowledgement and informs other traffic of revised ETD	Waterway management
00:30	The vessel informs VTS of intended departure	VTS issues traffic clearance with any	

Time	Vessel action	VTS action	Information category
		appropriate conditions attached	

Use case: Vessel transiting protected area

As a vessel is approaching a marine mammal protected area where a speed restriction may or may not be active depending on the presence of marine mammals. When marine mammals are present, vessels are advised digitally that a speed restriction is in effect. For example, the vessel receives a digital message and the extent of the area is displayed in the navigational systems.

Time	Vessel action	VTS action	Information category
00:00	Sailing in the vicinity of marine mammal protected area	Receives information confirming presence of marine mammals and activates the speed restriction area.	Enforcement
00:30	Approaches a marine mammal protected area	Sends automated digital message regarding active speed restriction and the area (text and visual)	Waterway management
02:00	Entering the marine mammal protected area	Confirm that speed restrictions are in force	Waterway management
02:10	Exceeding speed limit	Send automated digital alert message requesting vessel conform to speed limit	Enforcement

3.6 Information to be provided

(More to come).

3.7 Associated technical services

Name	ID (MRN)	Description	Standardization Body

3.8 Relation to other MSs

MS 3 has a relationship with other Maritime Services where it affects the VTS.

Examples may be different depending on the coastal State arrangements.

Description	Examples of data that could be of interest for MS 3
MS 1 VTS INS	(More to come)

MS 2 VTS NAS	(More to come)
MS 4 Local Port Service	Delays, obstruction, cargo operations, port availability and anchorage area in the port, ISPS state, Marsec level
MS 5 Maritime Safety Information	All information depending on structure of MSI
MS 6 Pilotage Service	Pilot orders and updates
MS 7 Tug Service	Tug order and updates
MS 8 Vessel Shore Reporting	Notification of arrival, dangerous cargo etc.
MS 9 Telemedical	Delays
MS 10 Maritime Assistance Service	Notifications, routeing, places of refuge
MS 11 Nautical Chart Service	Local Area updates, chart updates
MS 12 Nautical Publication Service	Updates to publication
MS 13 Ice Navigation Service	Ice routes, ice conditions, ice breaking assistance
MS 14 Meteorological Service	Weather information
MS 15 Real Time Hydrographic 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 5 - Maritime Safety Information (MSI) Service

5.1 Submitting Organization

IHO and WMO.

5.2 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 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.

5.3 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) on *Promulgation of Maritime Safety Information*.

SOLAS regulations V/4 through V/7 govern the contracting government's responsibilities with regards 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 have been described by the *International SafetyNET Manual* (MSC.1/Circ.1364, as revised).

The roles and responsibilities of a METAREA Coordinator are defined in resolution A.1051(27) 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.

5.4 Operational approach

The MSI Service, as defined in resolution A.705(17), 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:

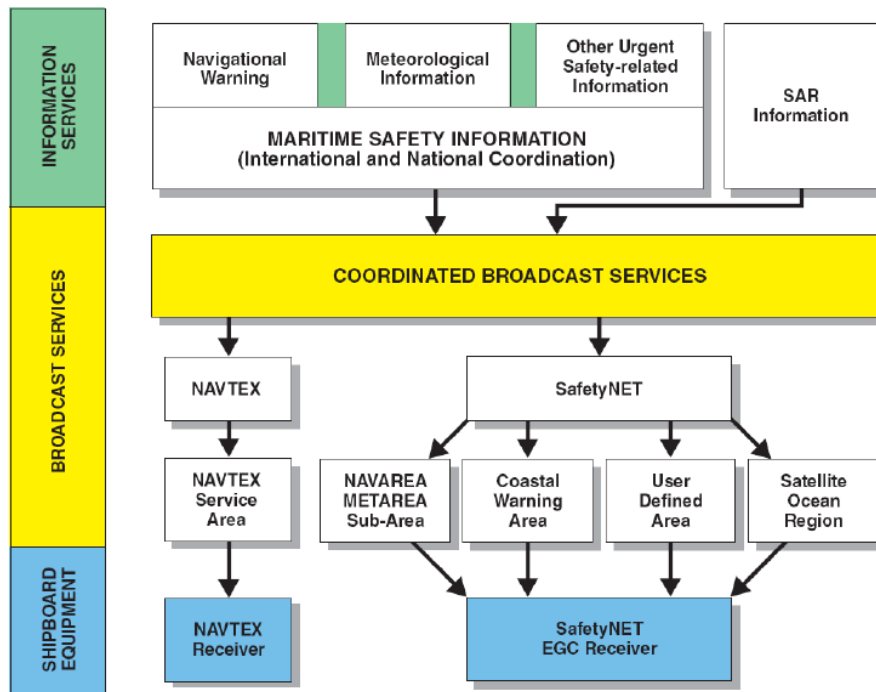


Figure 5-1: The maritime safety information service of the Global Maritime Distress and Safety System (Source: S-53)

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

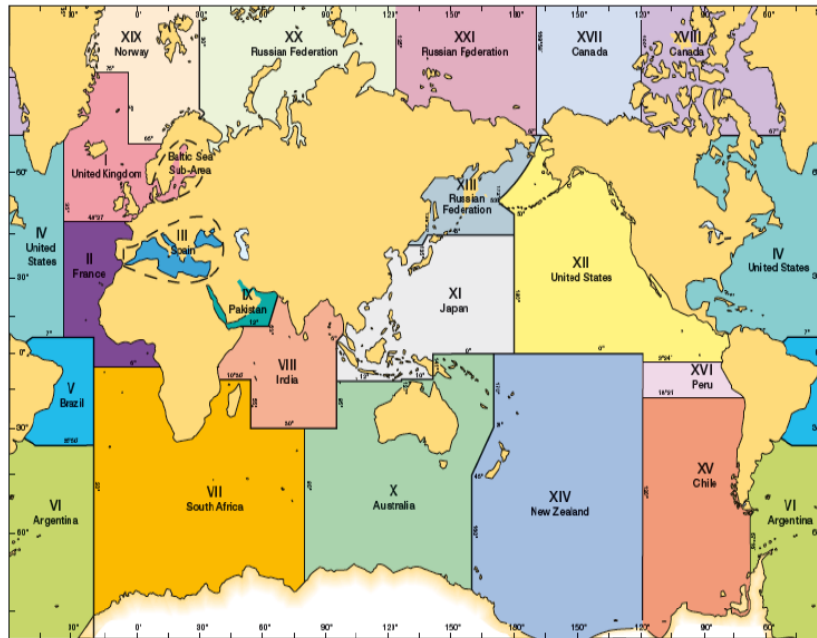


Figure 5-2: NAVAREAs for coordinating and promulgating navigational warnings under the World-Wide Navigational Warning Service (Source: S-53)



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)

5.5 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)?

5.6 Information to be provided

MSI Services, as listed in resolution A.706(17) on *IMO/IHO World-Wide Navigational Warning Service - Guidance Document*, as amended, 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 ² :
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;

² Examples from resolution A.706(17), as revised, Document Review Working Group 2018, and the Manual on Marine Meteorological Services.

Information related to:	Examples ² :
	<p>.3 establishment of major new aids to navigation or significant changes to existing ones, when such establishment or change might be misleading to shipping;</p> <p>.4 the presence of large unwieldy tows in congested waters;</p> <p>.5 drifting hazards (including derelict ships, ice, mines, containers, other large items over 6 metres in length, etc.);</p> <p>.6 areas where search and rescue (SAR) and anti-pollution operations are being carried out (for avoidance of such areas);</p> <p>.7 the presence of newly discovered rocks, shoals, reefs and wrecks likely to constitute a danger to shipping, and, if relevant, their marking;</p> <p>.8 unexpected alteration or suspension of established routes;</p> <p>.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;</p> <p>.10 the establishment of research or scientific instruments in or near shipping lanes;</p> <p>.11 the establishment of offshore structures in or near shipping lanes;</p> <p>.12 significant malfunctioning of radio navigation services and shore-based maritime safety information radio or satellite services;</p> <p>.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;</p> <p>.14 acts of piracy and armed robbery against ships;</p> <p>.15 tsunamis and other natural phenomena, such as abnormal changes to sea level;</p> <p>.16 World Health Organization (WHO) health advisory information; and</p> <p>.17 security-related requirements.</p>
<p>Marine weather warnings and forecasts</p>	<p>For high seas areas: Forecasts shall include wind parameters, sea state and visibility.</p> <p>Warnings shall be provided for the following phenomena:</p> <ul style="list-style-type: none"> • wind warnings of gale force (Beaufort force 8) and above; and • ice accretion.

Information related to:	Examples ² :
	<p>For coastal areas: Forecasts shall include wind parameters, waves (sea and swell), and ice accretion where applicable.</p> <p>Warnings shall be given for the following phenomena:</p> <ul style="list-style-type: none"> • winds of gale force (Beaufort 8) and above; • potentially hazardous ice accretion; and • unusual and hazardous sea-ice conditions. <p>Warnings should be given for the following phenomena:</p> <ul style="list-style-type: none"> • near gales (Beaufort force 7); • severe thunderstorms/squall lines; • restricted visibility (one nautical mile or less); • storm-induced water-level changes; and • tsunami.

5.7 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, or EGC where no NAVTEX services exist; and
- Enhanced Group Call Services (EGC) (e.g. SafetyNET): broadcasts which cover all the waters of the globe except for Sea Area A4, as defined by resolution A.801(19) on *Provision of Radio Services for the GMDSS*, annex 3, as amended.

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 IMO Recognized Satellite Service	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 [to be described once developed]	
NAVDAT		Delivery of MSI via NAVDAT	ITU-R M.2010
AIS-T – ASM AIS-S – ASM AIS – VDES		Delivery of MSI via AIS: • Message 14 • Message 8 • Message 21	ITU 1371-5 SN.1/Circ.289 IALA 124

		• Data via VDES	
Maritime Connectivity Platform	urn:mrn:mcl	Provision of MSI [to be described once developed]	IALA

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

5.8 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.

MS No.	Identified Services	Identified Responsible Service Provider
1	VTS Information Service (INS)	VTS Authority
4	Local port Service (LPS)	Local Port/Harbour Authority
11	Nautical Chart Service	National Hydrographic Authority / Organization
13	Ice Service	National Competent Authority Organization
14	Meteorological information service	National Meteorological Authority Public Institutions
15	Real-time hydrographic and environmental information service	National Hydrographic and Meteorological Authorities
16	Search and Rescue Service	SAR Authorities

MS 6 - Pilotage service

6.1 Submitting Organization

IMPA

6.2 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.

6.3 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.

6.4 Operational approach

Pilot organizations providing pilotage service in an area could provide information to ships about the pilotage service in a digital and easy 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/her pilotage duties.

Examples of information can be:

Information related to:	Examples
General information	Examples of information: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none">• 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.
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6.5 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.

6.6 Information to be provided

See in section 6.4

6.7 Associated technical services

Name	ID (MRN)	Description	Standardization body

6.8 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.

MS 7 - Tug service

7.1 Submitting Organization

Norway

7.2 Description of the Maritime Service

This Maritime Service range from small vessels with limited capacity and service in ports and rivers to oceangoing vessels built for complex operations and salvage. This service 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; and
- oil spill response.

The need of tug services differ from port to port, type of vessel and cargo. In some cases, information about a tug service capacity and/or availability may be difficult to obtain due to communication deficiencies. This maritime service is intended to improve information availability of tug services.

Tug services would encompass all kinds of tugs, such as:

- conventional;
- azimuth stern drive;
- tractor; and
- rotor.

Information related to:	Examples of information shared in a tug service
Deep sea information	<ul style="list-style-type: none"> • Contact information for tug vessel / operator • Safety procedures and regulations • Available resources • Working hours
Local port or river information	<ul style="list-style-type: none"> • Contact information for tug vessel / operator • Mooring and berthing information • Available resources • Working hours
Tug information	<ul style="list-style-type: none"> • Type of tug • Capacity such as 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

7.3 Purpose

This Maritime Service 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 ship officer 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. The types of information which can be exchanged include:

- ETA (request);
- confirmation requests;
- updates on transit status and tug availability;
- updates among stakeholders; and
- standardized messages to overcome language barriers.

7.4 Operational approach

Tugs 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.

Like the Local Port Service, 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 ships' 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 communications may include:

- ship's size;
- number of tugs required;
- time the service is required;
- time the tug may be on site;
- estimated duration of operations; and
- end of operations.

Access to this information electronically would enhance the awareness of a ship's time-stamp.

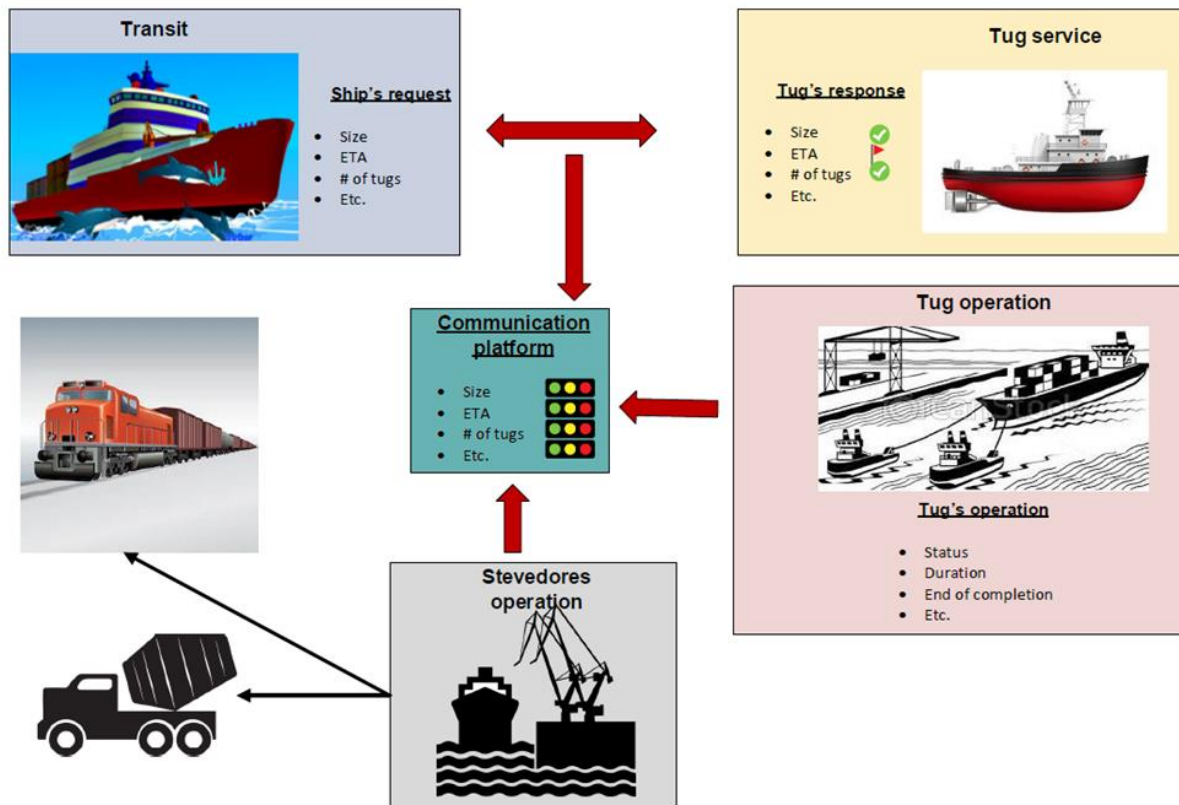


Figure 7-1: Example of an electronic communication platform for all actors involved in the tug operations.

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 User needs

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; and
- duration of operations.

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 the user needs and this communication link would also benefit all other actors.

7.6 Information to be provided

(More to come).

7.7 Associated technical services

Name	ID (MRN)	Description	Standardization body

(More to come)

7.8 Relation with other Maritime Services

Description	Examples of data that could be used in MS 7
MS 1 VTS IS	VTS area, types of VTS services, VTS contact information, places of refuge, local regulations, limitation, visibility, information regarding traffic in the area
MS 3 VTS TOS	Traffic clearance, time slots
MS 4 Local Port Service	Berthing information, time slots, security, local regulations, supply, assistance, port contact information
MS 5 Maritime Safety Information	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 for the operations at hand
MS 13 Ice Navigation Service	Ice chart, ice conditions, information regarding icebreaker service / assistance, ice routes
MS 14 Meteorological Service	Information regarding weather in the area
MS 15 Real Time Hydro and Information Service	Information from real time sensors
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

Norway

[8.2 Description of Maritime Service

This Maritime service provides information from shore to ship about two different reporting regimes. The first regime is Vessel Shore Reporting (VSR), implemented for pre-arrival 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. The VSR regime may contain the following elements:

- Marine security regulations;
- Vessel Traffic Services zones regulations;
- Customs and immigration regulations;
- Port State regulations;
- Health and veterinary regulations; and
- Environmental regulations.

Many of these elements will be addressed by the IMO Facilitation Committee, which is developing the specifications for the Single Window Reporting System. This is linked to e-navigation Strategy Implementation Plan Solution 2 - Means for standardized and automated reporting.

IMO e-navigation solution 2, regarding automated ship reporting, is one of the most important solutions to reduce the mariners' workload (amount of time spent on preparing and submitting reports to shore-based authorities). To achieve this, reports should be automatically generated as much as possible from on-board systems.

The second regime is linked to a transit in an area where a Ship Reporting System (SRS) is established.

In SRS 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.

Resolution MSC.43(64) on *Guidelines and criteria for ship reporting systems*, as amended, recalls that communication between a shore-based authority and a participating ship should be limited to information essential to achieve the objectives of the SRS. 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; and
- position.

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

"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. 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.43(64) 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.

A VSR system normally includes a web solution and an onshore representative, or agency, for the vessel operator or owner. The agency acts on behalf of the master or owner and provides information to relevant authorities.

The VSR as envisaged by e-navigation solution 2 aims to reduce time-consuming paperwork on board.

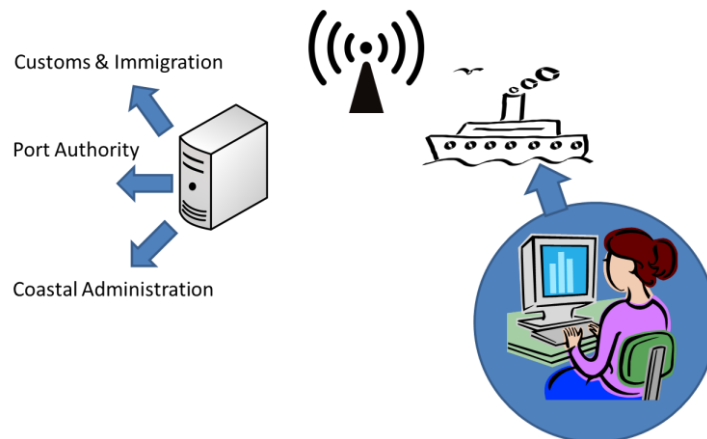


Figure 8-1: [...]

Information required to be transmitted as part of a mandatory SRS is generally transmitted to the VTS centre, or the relevant authority, via VHF voice communication. Some SRSs also accept reports transmitted through AIS, internet-based reporting systems, e-mail, fax, SATcom, mobile phone, or a combination of these communication means.

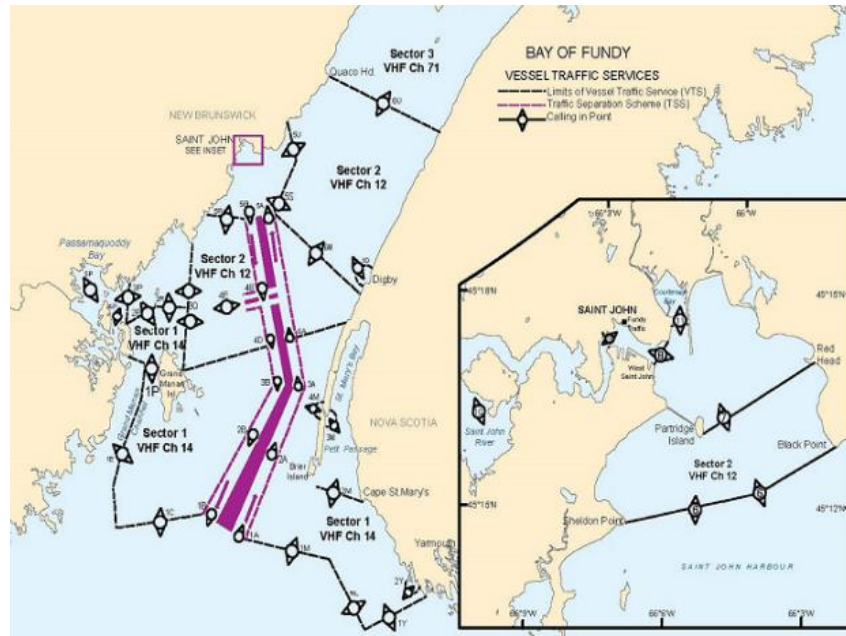


Figure 8-2: Examples of reporting points from Bay of Fundy

8.3 Purpose

The purpose of this Maritime Service is to:

- secure submission and distribution of reports required by shore-based authorities in the harmonized standard and in the required timeframe;
- reduce the administrative burden on board the ship 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.

Resolution MSC.43(64) states that the objectives of SRS should be based upon:

"the improvement of the safety of life at sea, the safety and efficiency of navigation and/or to increase the protection of the marine environment. They may or may not be operated as part of a vessel traffic service."

As such, the VSR service contributes to the traffic situational awareness of a coastal administration either by being informed of vessels heading into its waters or the ones already in transit. Based on the information collected, a coastal administration can initiate an intervention plan, if required.

8.4 Operational approach

Electronic systems for ship reporting should use the same protocols and product specifications, in a Single Window solution, to send digital pre-arrival information such as the FAL forms and

other regional/national requirements, as defined in SOLAS regulation V/11/2 for ship reporting systems. 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 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	<ul style="list-style-type: none">• 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, IMDG information, waste declaration, ship's certificates, ports of call list, dangerous cargo declaration and manifests, vaccination list, narcotic list, ship's money declaration, etc.• When / What to report (e.g. 24h, 48h, 72h, 96h before arrival)• To whom (e.g. immigrations, police, port master, etc.)
Reporting tools	<ul style="list-style-type: none">• Web, App, etc.• Communication• Guidelines
Shore receivers and support	<ul style="list-style-type: none">• 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 96h 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 transit.

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

- AIS;
- internet-based reporting systems;
- e-mail;
- fax;
- SATCOM;
- mobile phone; or

- a combination of these systems.

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.

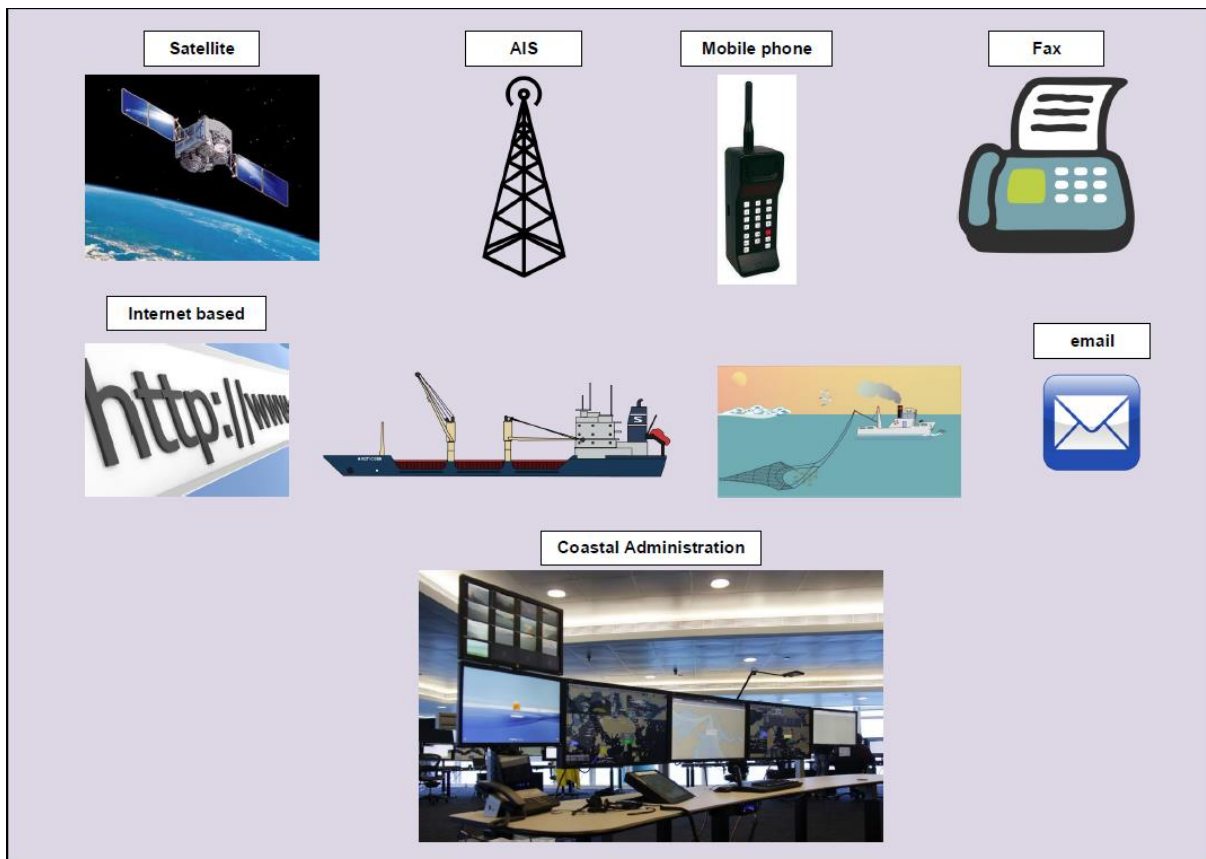


Figure 8-3: Example of current communication systems used to report information

Some of these reporting systems are not using a digital format, which prevents 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. Specific requirements requested by an Administration would be part of the form pertaining to this country.

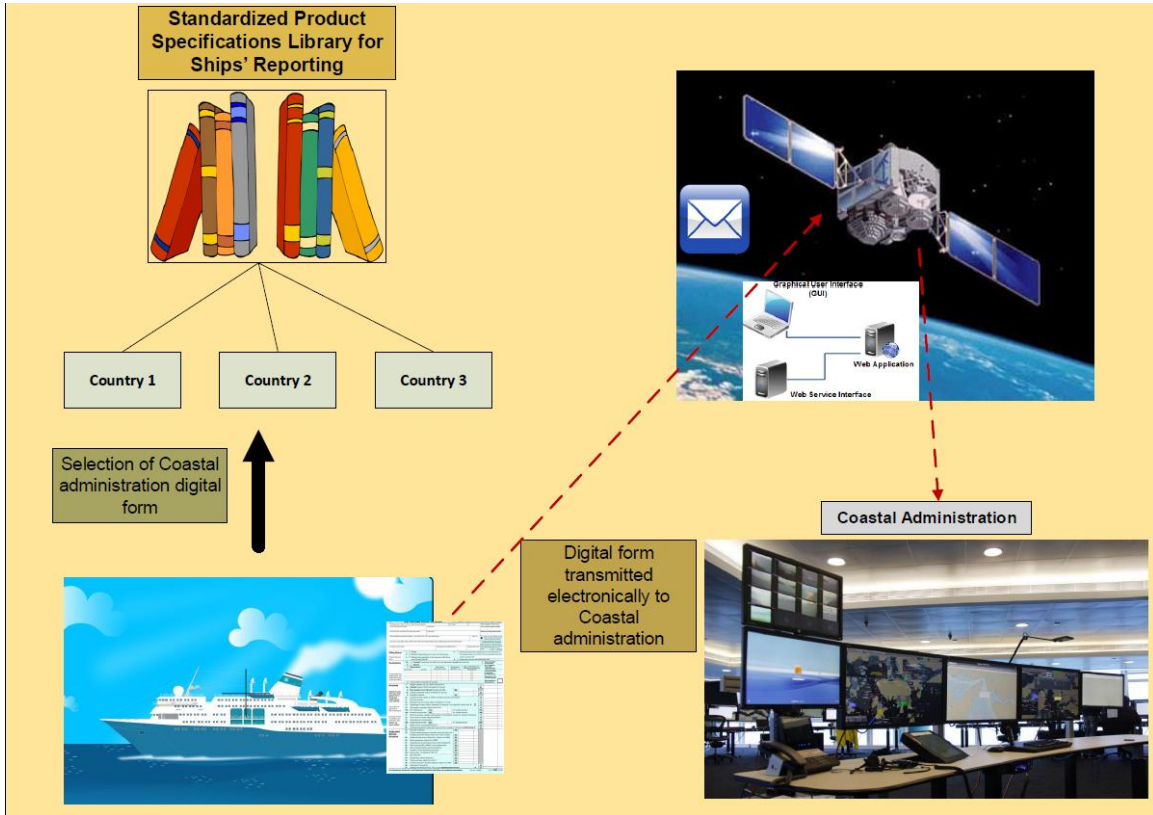


Figure 8-4: Example of electronic communication systems using a standardized product specifications library

Basic information such as the ship name, call sign, IMO number and MMSI, etc., can be automatically collected from the ship's AIS system and transmitted through terrestrial or satellite AIS.

8.5 User needs

Ships' masters are facing considerable administrative burden to comply with different mandatory VSR 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 vessel reporting system also requires developing and maintaining an S-100 Product Specification for 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.

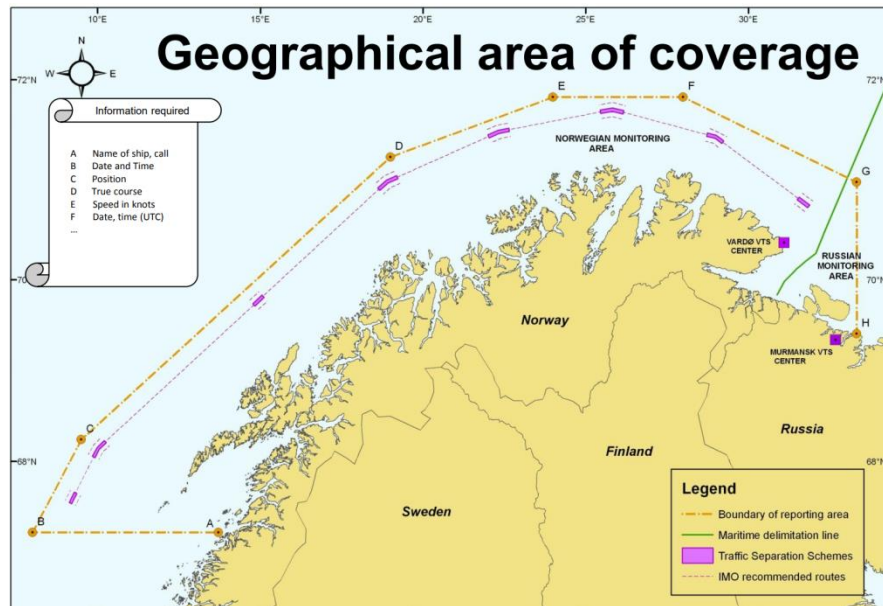


Figure 8-5: BAREP SRS between the Russian federation and Norway

8.6 Information to be provided

8.7 Associated technical services

To be capable of generating this information automatically and transmitting it automatically, a realistic operational implementation of the VSR service would require the involvement of both coastal administrations and shipowners. Coastal administrations would need to develop an international library of ship reports that are uniquely identified and characterized by their requirements for format, deadline, content, etc. This library would be part of the S 10x register and standardized product specifications (e.g. S-127 and S-421) would be developed and maintained in order to generate the required reports.

Name	ID (MRN)	Description	Architect(s)	Standardization Body

8.8 Relation with 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, coast guard, customs, etc.) claiming the information, the list below gives example of services that can benefit from access to ship reporting information.

Description	Examples of data that could be used from MS 10

MS 1 VTS IS	Type of vessel, nationality, MMSI, IMO no, contact information
MS2 VTS NAS	Draft, cargo
MS3 VTS TOS	ETA / ATA, ISPS information, purpose for arrival
MS4 Local Port Service	The majority of the information in a ship reporting system is useful and can be re-used an effective and transparent port operation
MS 5 Maritime Safety Information	Inform about 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.
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	Contain charted information about areas where reporting is required
MS 12 Nautical Publications Service	Contain detail 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.

]

MS 9 - Telemedical Assistance Service (TMAS)

9.1 Submitting Organization

Norway

9.2 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*).

9.3 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 personal 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 e-mail. 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.

9.4 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 type 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 tele-surgery) allows the surgeon to remotely perform surgery either using direct tele-manipulator 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.

9.5 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.

9.6 Information to be provided

(More to come)

9.7 Associated technical services

Name	ID (MRN)	Description	Standardization Body

9.8 Relation with other digital maritime services

Description	Examples of data that could be used from MS 9
MS 1 VTS IS	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 (MAS)

10.1 Submitting Organization

Norway

10.2 Description of the Maritime Service

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

- the ship is involved in an incident (e.g., loss of cargo, accidental discharge of oil, etc.) 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 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 the MRCC and not the MAS will have priority. As such, the MAS is responsible only for receiving and transmitting communications and monitoring the situation.

The establishment of a MAS should not necessarily entail the setting up of a new organization. The functions of the MAS could, at the discretion of the Administration, be discharged by an existing organization, preferably an MRCC, or alternatively a harbour master's office, a coast guard 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). Information on MAS is periodically updated in the Global Integrated Shipping Information System (GISIS), maintained by IMO. National organizations that disseminate nautical information are invited to publish such particulars.

10.3 Purpose

The purpose of this Maritime Service is to manage communications between the coastal State, ship's officers requiring assistance, and other responsible maritime organizations: fleet owners, salvage companies, port authorities, brokers, etc. As an intermediary, the main purposes of the MAS are:

- receiving the reports, consultations and notifications required by the IMO instruments referred to in resolution A.950(23), annex;
- 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.

10.4 Operational approach

Resolution A.950(23) indicates that a MAS should be operational on a 24-hour basis and that it should be possible for the English language to be used in exchanges between a ship in need of assistance and a MAS. Also, MASs should be authorized by their respective governments to exchange information concerning reports received and situations involving ships which may be in need of assistance with each other.

According to [resolution A.949(23)], the most common events requiring MAS are:

- fire;
- explosion;
- damage to the ship, including mechanical and/or structural failure;
- collision;
- pollution;
- impaired vessel stability; and
- grounding.

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

The development of a database containing the key services contact information and availability of their respective resources would help move towards the digitalization of the MAS. Also, the use of templates listing the types of incidents that commonly occurring and their level of severity could facilitate ship – shore based communication. The exchange of information on key services, their contact details, capabilities and geographic 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 functions of a MAS:

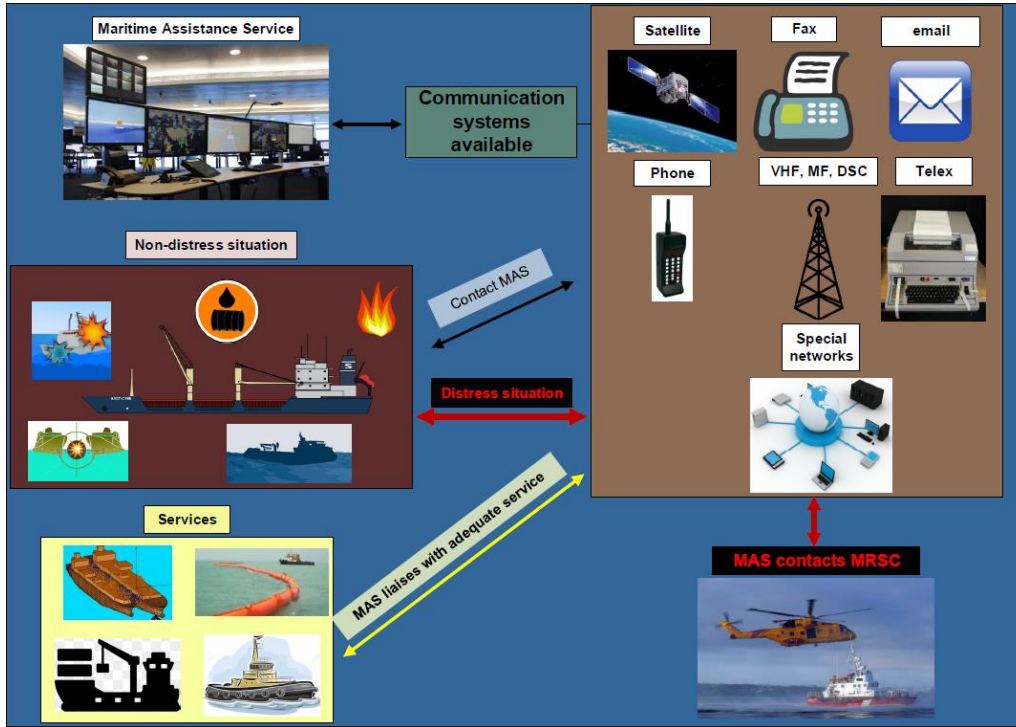


Figure 10-1: Illustration of some functions provided by a MAS

10.5 User needs

Information related to:	Examples
General information	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

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 be done taking 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.

10.6 Information to be provided

(More to come)

10.7 Associated technical services

Regarding communication facilities, resolution A.950(23) recommends the use of COMSAR/Circ.18 on *Guidance on minimum communication needs of maritime rescue co-ordination centres (MRCCs)*, 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;
- 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
- Inmarsat-C ship earth station or other satellite service providers.

S-123 (Marine Radio Service) data products contain contact details for MRCCs.

Name	ID (MRN)	Description	Standardization Body

10.8 Relation with other the Maritime Services

Description	Examples of data that could be used in MS 10
MS 1 VTS IS	Local sensor information such as CCTV, Radar, AIS. Regulations. Other traffic.
MS 2 VTS NAS	Exchange of routes, directions, navigation advices and assistance
MS3 VTS TOS	Information regarding regulations and other traffic
MS 4 Local Port Service	Port availability and anchorage are in the port, services related to the MAS situation
MS 5 Maritime Safety Information	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	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
MS 14 Meteorological Service	Weather information, visibility, wave information
MS 15 Real Time Hydro and Information Service	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 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 seafloor, 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 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 must include update functions to ensure that all navigational products and service are kept current. Update information must be delivered in a standardised format. Distribution networks should conform to standardised data authentication and distribution standards to ensure their safe and secure transmission and delivery.

11.3 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 information provided as part of other services such as Nautical Publication Services and Real Time Hydrographic and Environmental Information Services. Nautical Chart Service should support functions such as; voyage planning, pilotage, collision avoidance, vessel traffic managements etc.

A Nautical Chart Service should include discovery metadata information that will enable users to determine what product and services are available within a given area of interest (both geographic and contextual).

11.4 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 harmonised way. The products should take into account a harmonised display of navigational information. The portrayal of digital Nautical Chart Services should conform to IMO / IHO standards.

The provision of Nautical Chart Service 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 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 datasets, and associated feature and portrayal catalogues.

11.5 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 provide navigational information for safe navigation on open sea, for making landfall, and for navigation in confined waters.

11.6 Information to be provided

The appropriate resolutions and recommendations adopted by the International Hydrographic Organization provide the recommended set of information to be covered by the Nautical Chart Service.

Information related to:	Examples:
Geographical features	<ul style="list-style-type: none"> • Coastline • Inland topography • Bathymetry • Rivers
Transits and routeing	<ul style="list-style-type: none"> • Routes in constricted shipping lanes • Associated Vessel Traffic Service • Associated Ship Reporting System
Ports approaches and entry	<ul style="list-style-type: none"> • Hazards, directions, limiting conditions • Pilot service, outer anchorages • Navigational aids
Protected area information	<ul style="list-style-type: none"> • Locations of marine protected areas • Restrictions and regulations applicable within specific areas
Regulatory information	<ul style="list-style-type: none"> • 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
Navigation aids	<ul style="list-style-type: none"> • descriptions of Lights • descriptions of buoys
Planning	<ul style="list-style-type: none"> • Mariners' Routeing Guides
Controlled areas	<ul style="list-style-type: none"> • Vessel Traffic Service contact information • Ship Reporting System contact information • Exercise Area contact information
Metadata	<ul style="list-style-type: none"> • Update information • Projection / spheroid • Data bounding polygon

11.7 Associated technical services

Name	ID (MRN)	Description	Standardization body

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.

11.8 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 Nautical Chart Service.

Description	Examples of data that could be used by MS 11
MS 1 VTS IS	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
MS 2 VTS NAS	Recommended routes, directions, navigation advices
MS 4 Maritime Safety Information	Area of the service, contact information, communication, navigational warnings issued by the MSI service
MS 5 Pilotage	Pilot boarding areas

MS 12 - Nautical Publications Service

12.1 Submitting Organization

IHO

12.2 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 made 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.

12.3 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 datasets based on internationally harmonized and appropriate data models (NP3). The datasets 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;
- .4 integration of appropriate new sources of nautical publications information into the supply and production chain for NP3 data products;
- .5 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;
- .6 application upgrades or new application development to make best use of the digital products; and
- .7 test-beds for the data products, delivery methods, and applications.

12.4 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 harmonised 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 datasets 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 Service 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.

12.5 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.

12.6 Information to be provided

The appropriate resolutions and recommendations adopted by the International Hydrographic Organization provide the recommended set of information to be covered by the Nautical Publication Service.

Information related to:	Examples:
Transits and routeing	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Hazards, directions, limiting conditions • Pilot service, outer anchorages • Traffic regulation, arrival procedure
Summary information about port facilities	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Geographic availability of services • Frequencies and channels used and broadcast schedules • Purposes supported – Weather forecasts, MSI, telemedical assistance etc.
Protected area information	<ul style="list-style-type: none"> • Locations of marine protected areas • Restrictions and regulations applicable within specific areas
Prevailing natural conditions	<ul style="list-style-type: none"> • Seasonal hazardous conditions • Periodic (e.g., tide-related) or irregular hazardous conditions
Regulatory information	<ul style="list-style-type: none"> • 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

Port Services	<ul style="list-style-type: none"> • 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
Navigation aids	<ul style="list-style-type: none"> • descriptions of Lights • descriptions of buoys
Climatic Information, predictions	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Mariners' Routeing Guides
Controlled areas	<ul style="list-style-type: none"> • Vessel Traffic Service contact information • Ship Reporting System contact information • Exercise Area contact information
Chart catalogue	<ul style="list-style-type: none"> • Graphically display a chart catalogue³

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 dataset or as incremental updates) in a format which supports the automatic correction and the traceability of the corrections of the on-board datasets.

12.7 Associated technical services

Name	ID (MRN)	Description	Standardization body

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 insures that the data will not be corrupted during the transport from the producing HO to the end user.

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

³ 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."

12.8 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 Nautical Publications Service.

Description	Examples of data that could be used by MS 12
MS 1 VTS IS	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
MS 2 VTS NAS	Recommended routes, directions, navigation advices
MS3 VTS TOS	Not relevant
MS 4 Local Port Service	Port security, facilitation and anchorage area, services related to the vessel, arrival procedure, contact information, communication
MS 5 Maritime Safety Information	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 MAS	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 Service	Local weather phenomena, climatic information, wave information
MS 15 Real Time Hydrographic and Environmental Information Service	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 Description of the Maritime Service

To provide ice navigation information to ships in and in the vicinity of possible ice infested regions.

13.3 Purpose

The World Meteorological Organization's Manual on Marine Meteorology (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 whether or not 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) outlines the environmental information requirements for ships operating in polar waters. The Polar Code reinforces operating guidelines for the hazard of Ice Accretion and Ice Waters (sea-ice conditions), and introduces new 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 259 "WMO Sea-Ice Nomenclature" (vol.I – Terminology, vol.III – International System of Sea-Ice Symbols) with 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 574 "Sea-Ice Information Services in the World" has comprehensive up-to-date information on National Ice Services. Resolution A.1051(27) *on IMO/WMO Worldwide Met-Ocean Information and Warning Service - Guidance Document* outlines the functions of the Worldwide Met-Ocean Information and Warning Service. The Worldwide Met-Ocean Information and Warning Service (WWMIWS) provides met-ocean Maritime Safety Information (MSI) including sea-ice conditions and hazards to mariners.

13.4 Operational approach

Examples of Ice Navigation Services are listed in table 13-1.

Information related to:	Examples:
Ice conditions (as an ice chart)	<ul style="list-style-type: none"> • Near real-time and forecasts of: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Text summaries of ice conditions
Routeing aids	<ul style="list-style-type: none"> • Recommended routes • Ice navigator • Icebreaker assistance
Navigation Planning	<ul style="list-style-type: none"> • Risk assessment • 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 position of icebergs at specified times are required with information about their estimated size, concentration or number within certain area; and speed and direction of movement.

13.4.1 Ice analysis and forecast

Some 20 nations around the world offer an ice information service. Services may provide analysis of ice conditions and numerical short-term ice forecasts in a 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. Practically in all cases the ice charts are complemented by high and medium resolution satellite imagery – commonly optical and active microwave radar, with resolution and range dependant 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.

13.4.2 Vessel escort and ice breaking

Icebreaking and support services may be available to ships transiting ice-covered waters. Coast Guards 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 progress of shipping within their area of responsibility. Ice Operations Centres may also provide Recommended Ice Route services, such as routing maps.

13.4.3 Ice navigation planning

Voyage in the ice-covered waters is commonly preceded by planning and acquisition of permission for ice navigation in contact with regulatory bodies and icebreaking services. Planning and application process is dependent on the assigned ice class, region and season of navigation and is done using the acting in the region of operation risk assessment or other regulatory criteria, including risk assessment for voyage planning especially in bergy water operations.

13.5 User needs

Activity based information requirements:

Information related to	Examples
En-route or at sea	<ul style="list-style-type: none"> • Broad, area-based forecasts • Higher detail in complex waterways • Increased interest in synoptic features and movement • Longer forecast lead-time essential
Entering, transiting and exiting a port	<ul style="list-style-type: none"> • Point (small area) based forecasts, • High spatial and temporal detail • Real-time observations • Focus on short-term lead-times
At berth	<ul style="list-style-type: none"> • Forecasts of changes to ice conditions
Planning a trip	<ul style="list-style-type: none"> • Focus on short-term timeframes, as well as longer forecast lead-times • Forecasts and warnings • Specific details on timing of wind changes or hazardous weather leading to changes in ice conditions • Focus on forecast details for specific areas or routes
Vessel and equipment design	<ul style="list-style-type: none"> • Historical values of low air temperatures and water temperatures • Focus on ocean and sea routes

13.8 Information to be provided

(More to come)

13.9 Associated technical services

Name	ID (MRN)	Description	Standardization Body
Ice Service		Service that provides sea ice and iceberg information to mariners and related support services.	WMO/IOC

13.10 Relation to other Maritime Services

Description	Examples of data that could be used in MS 13
MS 5 Maritime Safety Information	Provides supplemental up-to-date information on the status of ice dangers.
MS 11 Nautical Chart Service	Provides supplemental navigational information
MS 12 Nautical Publication Service	Provides supplemental navigational information
MS 14 Meteorological Service	Provides supplemental navigational (meteorological) information
MS 15 Real-Time Hydro and Information Service	Provides supplemental navigational (hydrographic) information

MS 14 – Meteorological information service

14.1 Submitting Organization

WMO

14.2 Description of the Maritime Service

To provide meteorological information digitally to ships.

14.3 Purpose

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

- forecasts and warnings for the High Seas; and
- forecasts and warnings 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.

Resolution A.1051(27) on *IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document* outlines the functions of the Worldwide Met-Ocean Information and Warning Service (WWMIWS). The WWMIWS provides meteorological Maritime Safety Information (MSI) to mariners in the form of marine forecast and warning 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 SafetyNet and NAVTEX, which form part of the Global Maritime Distress and Safety System (GMDSS).

The International Code for Ships Operating in Polar Waters (Polar Code) outlines the environmental information requirements for ships operating in polar waters. The Polar Code reinforces operating guidelines for the hazard of Ice Accretion and Ice Waters (sea-ice conditions), and introduces new operating guidelines for hazards related to Low Air Temperature, and defines the Polar Service Temperature for equipment performance.

SOLAS regulation V/34, resolution A.893(21) on *Guidelines for voyage planning* and MSC/Circ.1063 on *Participation of ships in Weather Routing 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, and this would imply that WMO and its Members should oversee weather routing services and standards as well.

The standards for the portrayal of met-ocean conditions on Electronic Navigational Chart systems are documented within S-412.

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 Meteorological Information Service is listed in the table below:

Information related to:	Examples:
Wind	<ul style="list-style-type: none"> ● Wind speed, direction, gust information ● Real-time values from instruments or satellite
Waves	<ul style="list-style-type: none"> ● Forecast wave height, direction, period ● Real-time values from buoys or satellite
Atmospheric conditions	<ul style="list-style-type: none"> ● Forecast temperature, squalls, cloud, rainfall ● Real-time values from instruments or satellite
Ocean	<ul style="list-style-type: none"> ● Forecast surface temperature, currents, salinity ● Forecast sub-surface temperature and currents ● Real-time values from instruments and satellite
Weather systems	<ul style="list-style-type: none"> ● Mean Sea Level Pressure contours ● System features such as cold fronts, tropical cyclones, low pressure centres, high pressure centres ● Satellite images
Dangerous weather	<ul style="list-style-type: none"> ● Warnings about location, strength, and movement of storms ● Warnings about fog or phenomena causing reduced visibility, ice accretion, cold air temperature, squalls
Bulletins and forecasts	<ul style="list-style-type: none"> ● Surface weather analysis, synoptic features with barometric pressure ● Forecasts of wind, waves, weather
Polar Service Temperature	<ul style="list-style-type: none"> ● Historical values for ocean and port areas
Low Air Temperature	<ul style="list-style-type: none"> ● Forecasts of hazard areas ● Historical values for ocean and port areas
Ship observations	<ul style="list-style-type: none"> ● Receipt of reports from ships in the Voluntary Observation System ● Transmission of information extracted from received ship reports to shipping

Table 14-1 – Meteorological Information Service

MS14 can be delivered in all areas.

14.4 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 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 weather forecast for the journey;
- knowing the tides; and
- knowing the vessel limitations for the expected 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. The usefulness of a warning or a forecast depends on the accuracy of the prediction, the format and communication platform through which the information is delivered, its timeliness, i.e. the number of hours or days in advance of the event that the forecast can be provided, and the ability of the user to react to the information.

Warnings of ice accretion highlight areas where the accumulation of ice on the superstructure and deck equipment of vessels may potentially (effect depends on true wind and waves angles, tonnage, hull shape) 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.

14.5 User needs

Information related to	Examples
En-route or at sea	<ul style="list-style-type: none"> • Broad, area-based forecasts • Higher detail in complex waterways • Increased interest in synoptic features and movement • Longer forecast lead-time essential
Entering, transiting and exiting a port	<ul style="list-style-type: none"> • Point (small area) based forecasts, • High spatial and temporal detail • Real-time observations • Warnings of reduced visibility, squalls • Focus on short-term lead-times
At berth	<ul style="list-style-type: none"> • Warnings of squalls, thunderstorms • Forecasts of general weather conditions
Planning a trip	<ul style="list-style-type: none"> • Focus on short-term timeframes, as well as longer forecast lead-times • Increased interest in synoptic features and movement • Forecasts and warnings

	<ul style="list-style-type: none"> • Specific details on timing of wind changes or hazardous weather • Focus on forecast details for specific areas or routes
Vessel and equipment design	<ul style="list-style-type: none"> • Historical values of low air temperatures and water temperatures • Focus on ocean and sea routes

14.6 Information to be provided

(More to come)

14.7 Associated technical services

Name	ID (MRN)	Description	Standardization Body

14.8 Relation to other digital Maritime Services

Description	Examples of data that could be used in MS 14
MS 5 Maritime Safety Information	Provides supplemental up-to-date information on the status of extreme weather.
MS 11 Nautical Chart Service	Provides supplemental navigational information
MS 12 Nautical Publication Service	Provides supplemental navigational information
MS 13 Ice Navigation Service	Provides supplemental navigational information
MS 15 Real Time Hydro and Information Service	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 Description of the Maritime Service

Oceanic and Inland water level information is essential for 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.

15.1.3 Purpose

The development of electronic navigation systems that use high resolution bathymetric data, are demanding the provision of real-time water level data. The IHO water level specification provides a standardised mechanism to digitise and transfer water level data.

15.1.4 Operational approach

Water level data is usually provided by Hydrographic Organizations, or on their behalf by an approved authority. Datasets are based on an internationally harmonised model and data encoding specification. Water level datasets will be provided via online internet services or distributed by appropriate distribution networks used for other navigational products and services.

15.1.5 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. A 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.

15.1.6 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.

15.1.7 Associated technical services

Name	ID (MRN)	Description	Standardization body

15.1.8 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.

Description	Examples of data that could be used by MS 15
MS 11 Nautical Chart Service	Underlying chart layout, simplified water level information
MS 12 Nautical Publication Service	Description of long term tidal observations.
MS 14 Meteorological 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 Description of the Maritime Service

This Maritime Service provides digital information on surface current speed and direction to land-based and ship-board 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.

15.2.3 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 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 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

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

15.2.4 Operational approach

Data are created by Hydrographic Organizations and are disseminated via internet or other available channels.

One evolution of the marine service is the provision of datasets information based on an internationally harmonised and appropriate model. The datasets will be distributed by appropriate methods for use by on-board navigation equipment.

15.2.5 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.

15.2.6 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 are provided in various IHO Standards (e.g.: S-111, S-104 IHO recommendations).

15.2.7 Associated technical services

Name	ID (MRN)	Description	Standardization body

15.2.8 Relation to other Maritime Services

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

Description	Examples of data that could be used by MS 15
MS 11 Nautical Chart Service	Underlying chart layout, simplified water movement information
MS 12 Nautical Publication Service	Description of long term current observations.
MS 14 Meteorological Service	Information on storm surges
MS 16 Search and Rescue Service	Current influences on rescue operations.

MS 16 - Search and Rescue (SAR) Service

16.1 Submitting Organization

Norway

16.2 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, IMO's Maritime Safety Committee divided the world's oceans into thirteen 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 1, Organization and Management;
- Volume 2, Mission Co-ordination; and
- Volume 3, Mobile Facilities.

16.3 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.

16.4 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.

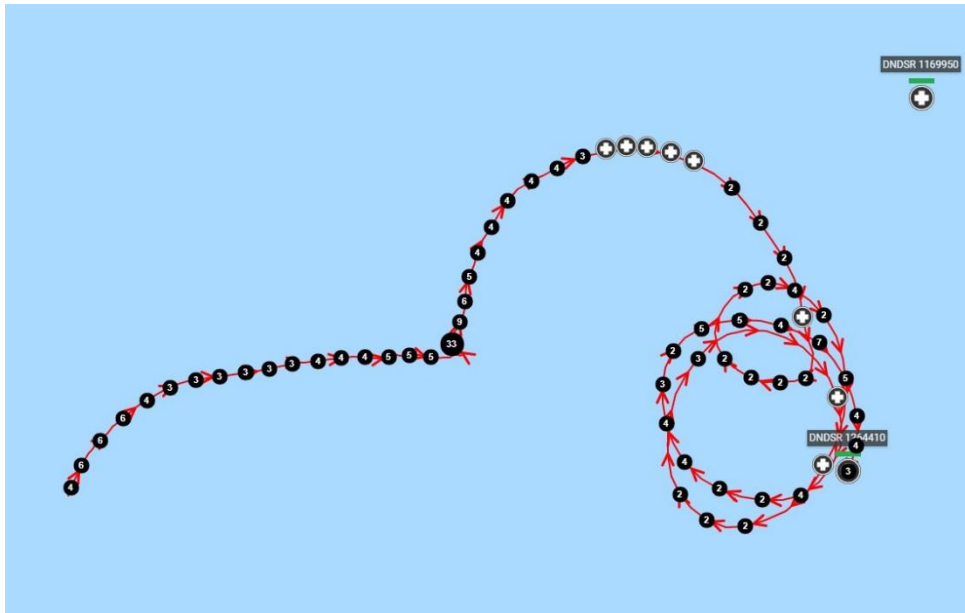
Several actors are normally involved in a SAR operation. Manual exchange of information can be easily misunderstood in the form of wrong positions, SAR areas and other significant search information, and even a short delay can be the difference between life and death. Lack of language skills has been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

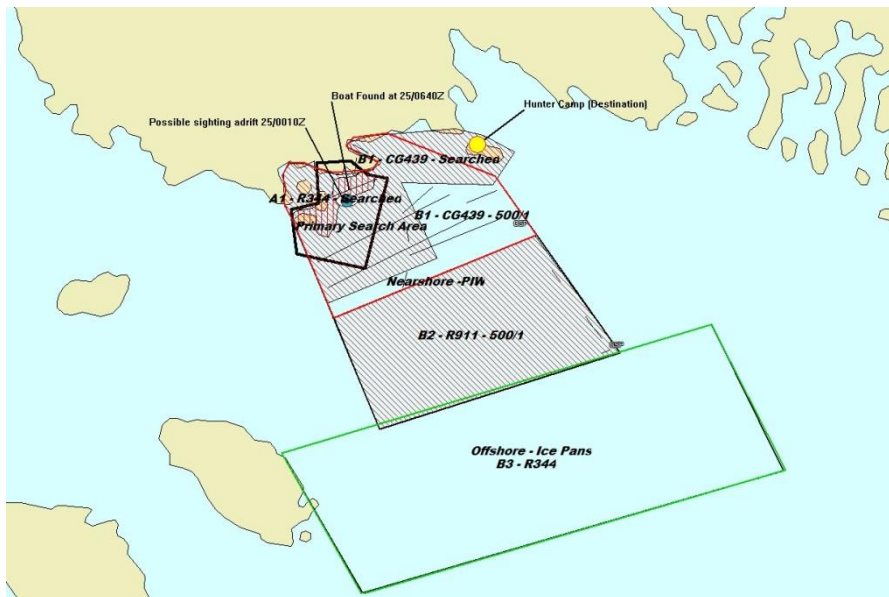
- last known position (LKP);
- search areas;
- search patterns;
- search resources;
- drift predictions;
- last known position (LKP);
- datum;
- radio frequencies;
- NOTSHIPS;
- known routing and planning information for search object (in the case of overdue aircraft or vessels);
- EPIRB hex codes and 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).



Credit photo: JRCC Halifax

Figure 16-1: Simulation of drift prediction



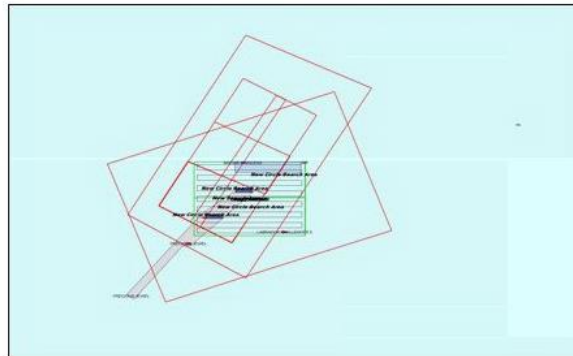
Credit photo: JRCC Halifax

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

SAR BRIEFING REPORT

Vessel Name

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



Nature of distress ManOverboard

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, 52 18.3N 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

Credit photo: JRCC Halifax

Figure 16-3: Illustration of a SAR Briefing Report

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 underway.

Information from several services assist 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 firefighting 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.

16.5 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	<ul style="list-style-type: none"> • Responsible RCC • Other emergency organizations assisting
SAR information	<ul style="list-style-type: none"> • 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 • 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 commander • Communication • Meteorological information
Assistance	<ul style="list-style-type: none"> • 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 • maneuvering limits • Communication

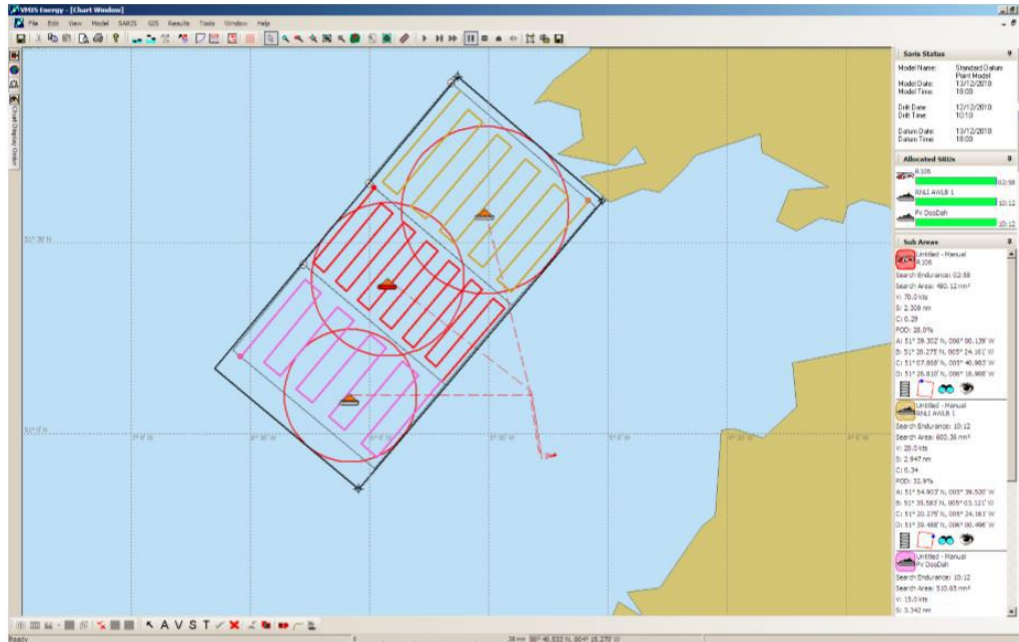


Figure 16-4: Example of common sharing of digital search and rescue information

16.6 Information to be provided

(More to come)

16.7 Associated technical services

Name	ID (MRN)	Description	Standardization Body

16.8 Relation with other digital maritime services

Description	Examples of data that could be used in MS 16
MS 1 VTS IS	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
MS2 VTS NAS	Information on vessels undertaking NAS, exchange of routes, navigation advice and assistance
MS3 VTS TOS	Traffic clearance information, time slots, ETAs, route advisories
MS4 Local Port Service	Port availability and anchorage areas, berthing information, cargo operations, security, supply, available assistance, port contact information

MS 5 Maritime Safety Information	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	Local address of medical centres and communication and capacity, medical advice
MS 10 Maritime Assistance Service	Contact information, places of refuge, routing, 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 for the operation
MS 13 Ice Navigation Service	Ice forecast, ice chart, ice conditions, information regarding icebreaker service / assistance, ice routes
MS 14 Meteorological Service	Weather in SAR area
MS 15 Real Time Hydro and Information Service	Tidal and current information in SAR area, all information from real time sensors
