

IMO/IHO HARMONIZATION GROUP ON
DATA MODELLING
Agenda item 4

HGDM 2/4/2
19 October 2018
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**DEVELOPMENT OF GUIDANCE ON THE DEFINITION AND HARMONIZATION OF THE
FORMAT AND STRUCTURE OF MARITIME SERVICES WITHIN A MARITIME SERVICE
PORTFOLIO, INCLUDING ASSOCIATED TEMPLATES**

Proposal for amendments to the draft guidelines

Submitted by Norway

SUMMARY

Executive summary: This document comments on the report of the Navigation Working Group at NCSR 5 and proposes amendments to the draft guidelines presented in document NCSR 5/WP.4, annex 2. The amendments include additional text and proposals for relocation of existing text in an attempt to improve both the structure and the content of the draft guidelines

Action to be taken: Paragraph 9

Related documents: NCSR 5/WP.4, annex 2 and NCSR 5/23, section 8

Introduction

1 This document comments on the report from the Navigation Working Group at NCSR 5 and proposes some amendments to the draft guidelines set out in annex 2 to the Working Group's report (NCSR 5/WP.4).

2 NCSR 5 considered the draft Assembly resolution developed by HGDM 1 and made some minor modification to the draft Guidance and the template, including a change to the title of the template.

3 NCSR 5 also considered the proposal by IALA (NCSR 5/8/3) and, after some modifications, agreed that the description of the specification of e-navigation technical services was useful to be included and inserted the text in appendix 2 of the draft Guidance.

4 NCSR 5 also agreed to the usefulness of the flowchart proposed by the Netherlands.

Discussion

5 Norway in general supported the outcome on the discussions on the draft guidance at NCSR 5. However, Norway is of the opinion that the flowchart proposed by the Netherlands is helpful guidance that should be included in the draft guidance.

6 Regarding the discussions on appendix 2, Norway believes this to be useful guidance that should be lifted into the main body of the draft guidelines. However, Norway is of the opinion that references to guidelines from other organizations should be more generic, hence amendments with the use of footnotes are proposed.

7 In addition we have proposed a section on "Overarching Architecture including communication framework". The content of this section is taken from the SIP.

8 Finally, it is proposed to include a new section on the relationship between the different levels of service descriptions.

Action requested of the HGDM

9 The HGDM is invited to consider the proposed draft amendments in the annex and take action as deemed appropriate.

ANNEX

GUIDANCE ON THE DEFINITION AND HARMONIZATION OF
THE FORMAT AND STRUCTURE OF MARITIME SERVICES
WITHIN THE MARITIME SERVICE PORTFOLIO (MSP)

Note:— Deleted text
New text

Innhold

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[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. MSI include 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 on all relevant marine information along the planned route, as well as

* Resolution A.705(17), as amended, on *Promulgation of maritime safety information (MSI)*. MSC.1/Circ.1310/Rev.1 on *Revised Joint IMO/IHO/WMO Manual on Maritime Safety Information (MSI)*.

information on any security risks, wave heights, swell and any information affecting the safe transit. 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. 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 are being considered to be transitioned from conventional transmission methods to contemporary digital technologies.

1.3 IMO as the lead organization for implementing e-navigation has agreed to take on the oversight work on providing marine information services for ships in a unified, digital format. Such marine information have been termed "Maritime Services" and this guidance envisages to harmonize the structure and formats of digitally-transmitted data and information and to display them in a harmonized way on the ship's bridge or shore-based facilities broadcasting and receiving marine information.

1.4 This Guidance envisages to harmonize the format and structure of a sub-set of marine information, namely Maritime Services (MS) Portfolios (MSPs). There are currently 16 Maritime Services Portfolios described in the SIP, each of them covering a certain service available to the ship (see NCSR 1/9 for the full list of MSPs). For example, MSI are promulgated as required by the functional requirement of the GMDSS, an internationally (WWRNWS and WWMIWS) and nationally coordinated network of broadcasts providing necessary information to ships for safe navigation, received by equipment which automatically monitors the appropriate transmissions, displays the information relevant for the voyage and provides a print capability.

1.5 MSI are transmitted using narrow band direct printing (NBDP) over NAVTEX, SafetyNet and HF within the GMDSS. As part of the current modernization of the GMDSS, new technologies that use digital information exchange are being considered, opening up the possibility to receive MSI in a more user-friendly way. Hence this Guidance is intended to provide an all-encompassing guidance to ensure that the format and structure for each of the data elements for each MSP follows the same structure and format. Therefore, SIP requires that all data models are S-100 conformant. The S-100 standard specifies the method for data modelling, developed and overseen by the International Hydrographic Organization (IHO). Based on the S-100 data modelling method a common maritime data structure (CMDS) is to be developed which forms the basis of developing specifications for digital data products.

1.6 This Guidance set out the general requirements for a service data model which, when a S-100 product specification exists for an MS (e.g. S-124 on product specification for navigational warnings), then such S-xxx structures should be used and each data item of the service.

1.7 As not all operational data can be easily incorporated into the CMDS based on a S-100 data model, this guidance provides a harmonized solution for the format and structure of all data models used as part for of a Maritime Service. Future Maritime Services will need to follow the format and structure of data elements already described in this Guidance.

2 Purpose

The purpose of this Guidance is to foster and to harmonize the implementation of the maritime services^{*} by providing templates for the description of these operational services, including references to their associated technical services, which should be used to implement them.

* See appendix 3

3 Application of the Guidance (former 4)

3.1 This Guidance is recommended for Administrations, international organizations as domain coordinating bodies and service providers.

3.2 For further information on a specific maritime service, other relevant standards and publications should be taken into account.

4 Terminology used (former 6)

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

- .1 *Maritime Service Portfolio (MSP)* defines and describes the a set of operational and technical Maritime Sservices and associated technical services provided in digital format their level of service provided by a stakeholder in a given sea area, waterway, or port, as appropriate. Hence, a "Maritime Service Portfolio" may also be construed as a set of "products" provided by a stakeholder in a given sea area, waterway, or port, as appropriate.
- .2 [Common Maritime Data Structure (CMDS) is based on the S-100 Universal Hydrographic Model of the International Hydrographic Organization. The S-100 standard is a method for data modelling by the International Hydrographic Organization (IHO). Based on the S-100 data modelling method, a common maritime data structure (CMDS) is to be developed which forms the basis of developing specifications for digital data products.]
- .3 *Maritime Service* [is a set of operational Maritime Services and associated technical services provided in digital form.]
- .4 *Operational Service...* [means the specification of a service from the operational perspective. This covers purpose and application of the service, stakeholders, regulations and processes and information exchanged. Operational Services are implemented with the assistance by a set of Technical Services.]
- .5 *Technical Services...* [are developed to implement the operational services. For example, the promulgation of tidal information from shore to ship by broadcasting data which is structured and encoded as specified by the IHO's S-104 standard. For Technical Services a specification should be given which contains services overview, service identification, operational Context, Service Data Model, Interface Specification including communication mechanisms, Dynamic Behaviour for example]
- .6 *S-100*[(to be provided by IHO – Anthony Pharaoh) is a data modelling, encoding and portrayal framework that uses and extends the ISO 19000 series of geographic standards for hydrographic, maritime and related issues. By using the framework, specific data models and portrayals are defined by a set of "S-100 Product Specifications" which are named by 3-digit numbers (S-XXX).]
- .7 [A *Data Model* is an abstract model that organizes elements of data and standardizes how they relate to one another and to properties of the real world entities. For instance, a data model may specify that the data element

representing an Aid to Navigation (AtoN) specification be composed of a number of other elements which, in turn, represent the position, colour and lights of the AtoN and define its owner.]

[5 Three levels of control or leadership (former 3)

Overarching coordination level

1 The Organization, in its role as leading e-navigation development and implementation, is responsible for guiding the establishment and harmonization of information and data transfers relating to maritime services. This includes providing leadership and overarching control and harmonization of information and data transfers relating to maritime services through the provision of guidance.

Functional and operational level

2 International organizations propose the definition of a specific maritime service, using the template as provided in annex appendix [1], to the Organization and manage and maintain the agreed definition through harmonized operational and technical specifications.

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

3bis When domain coordinating bodies for maritime services are unknown or may not exist, specifications derived from other maritime services may assist with harmonizing operational and technical specifications.

Service level

4 Service providers – Member States and authorities within Member States (e.g. port authorities, Hydrographic Offices, SAR services, etc.)]

~~5 Information on associated technical services (Not needed if it is agreed to include the text from Appendix 2)~~

~~[5.1 The interoperability of technical services is ensured by a coordinated approach of the domain coordinating bodies to define needed communication means and data models.]~~

~~[5.2 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.]~~

~~5.3 Appendix 2 provides the Description for the harmonized specification of e-navigation technical services and can be used by domain coordinating bodies to develop their own technical specification.~~

[6 Flow chart for the development of a new Maritime Service (NCSR 5/WP.4 annex 4 with some additional text)

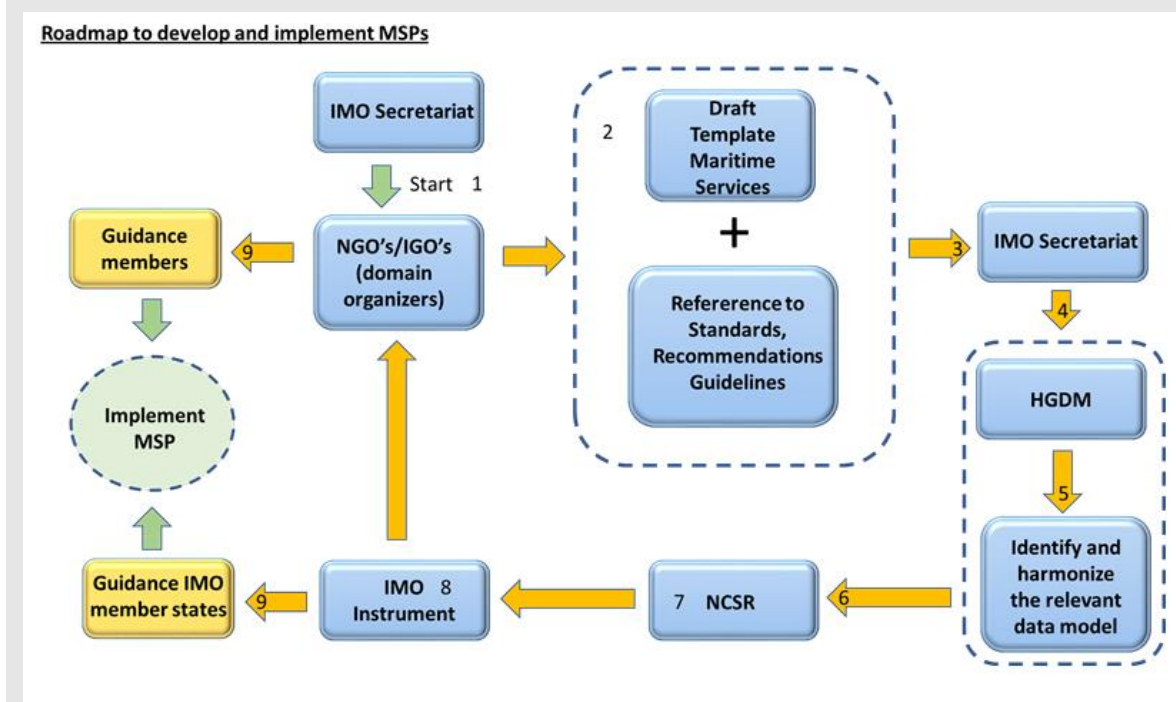
The schedule of the flow chart (figure 1) reflects a recommended process of steps to be followed, with the following clarification

1 These descriptions of maritime services, using the templates, should contain references to relevant international Standards, Recommendations and Guidelines which may contain criteria for the eventual implementation of these maritime services as well as identified user requirements for data and information;

2 The domain coordinating bodies should submit the descriptions of maritime services, using the template in appendix 1, to the Organization as the recipient (3), using the IMO Secretariat as a mailbox for automated registration and forwarding to the right IMO body.

3 The assigned IMO forum (for example HGDM) will study and evaluate the submitted descriptions of maritime services, using the templates, and identify potential harmonized data models (5) and finally report to with a request for consideration (7) to incorporate, where appropriate, an approved description of a maritime service, using the template, into [XXX (relevant IMO instrument)] (8)

4 The Organization should provide guidance to the member states and the domain organizers (relevant NGOs and IGOs) to their members (9) on how to implement maritime services.]



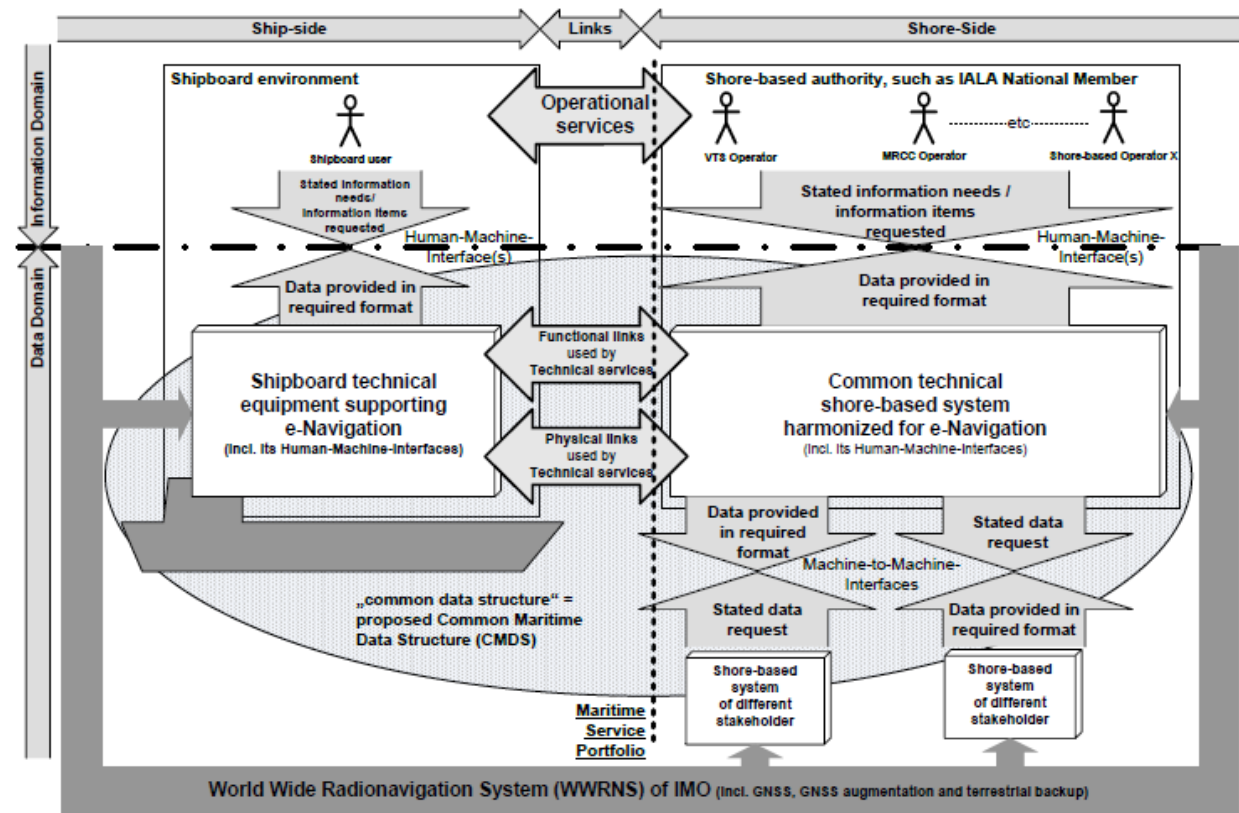
[Figure 1]

[7] Overarching Architecture including communication framework (new)

The figure below shows the principle of an information/data flow in the e-navigation architecture, set out in the SIP.

The figure includes the Common Maritime Data Structure (CMDS) that spans the whole of the horizontal axis and the World-Wide Radio Navigation System (WWRNS).

The architecture also brings into focus the "operational service" level and the "Functional links used by Technical services" and the "Physical links used by Technical services".]



[Figure 2 – Overarching e-navigation architecture]

[8 Relationship between the different levels of service descriptions (new)]

The operational description in the template reflects a common understanding and definition of a Maritime Service. This safeguard the harmonization of the information needed as decision support based on the userneeds and operational requirements. The information should be presented on a graphical display on board in accordance with E-navigation solution 4. The harmonized development of specifications in S-100 aims at ensuring userfriendliness for all relevant stakeholders in receiving and using the information in addition to enable the industry to develop systems based on the same datalanguage. A set of technical services is required as "glue" between the different product specifications in S-100.

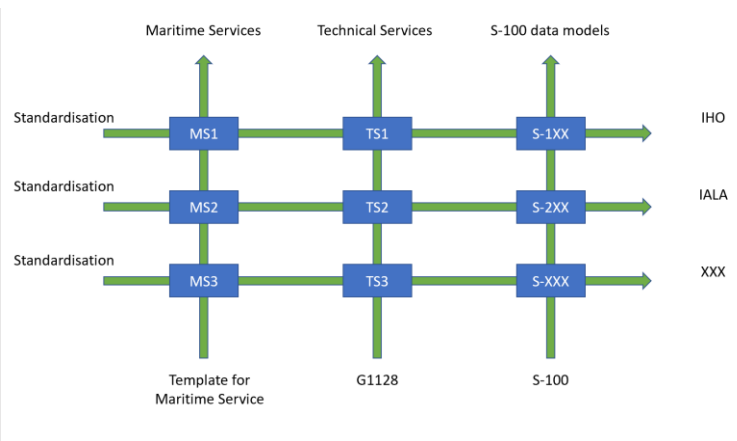


Figure 2 – Relationship between different service levels

The technical services are needed to coordinate a seamless combination between different product specifications.

Digital information regarding for instance a restricted area will combine several attributes and product specifications from a set of s-100s to provide the navigator with a complete information picture relevant for a safe navigation process.

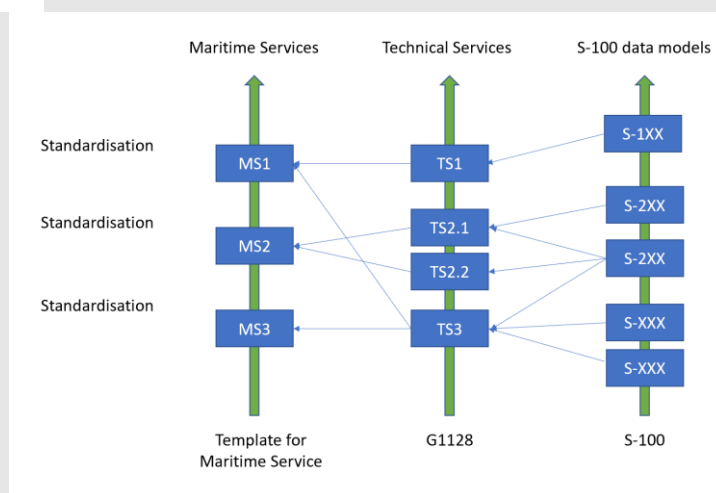


Figure 3 – Interaction between different service levels]

9 Description for the harmonized specification of e-navigation technical services (former appendix 2)

(It is proposed to delete appendix 2 and include the text as a new section here)

1 Maritime Services are high-level/operational services, such as organizing a tug service, VTS service or providing MSI information. 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 uniformly. Part of this template are the references to technical services relating in a standardized way to a specific Maritime Service. For harmonization these technical services should be specified.

2 The specifications is 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 IALA has developed a detailed Guideline for the specification of e-navigation technical services in accordance with the abovementioned structure and information elements (ref. IALA Guideline G1128). The Guideline is intended for use by engineers and developers that are responsible for making specifications of technical e-navigation services.

In order to achieve a harmonized use of technical services, it is recommended to use guidelines developed by the domain coordinating bodies[†] if available.

[†] IALA Guideline G1128
Other guidelines?

10 Relationship between Maritime Service and S-100 based product specification (new)

Several maritime services need to combine information from different sources and combine elements to make a holistic and user friendly information. The lack of this flexibility can result in limitation of usability and worse case in missing information.

Different parts of maritime services are linked together in a combination of different product specifications.

In addition, there is an overlap in responsibility to develop product specifications among different stakeholders. To avoid overlap and gaps between different product specifications, each maritime service should be harmonized by using a common methodology for defining features and attributes and their relation to S-10x.

If the feature and attributes is already covered by S-10x product specifications, this should be used. If the methodology reveals gaps in the S-10x, relevant stakeholders should be responsible for developing the S-10x needed.

The methodology in figure x shows a template used for some information required in MS1. [Appendix X] contains a complete template for MS1 (VTS information service).

Template Sample Excerpt for MS1

Type	CATEGORY	ATTRIBUTES	ATTRIBUTE DETAILS	ATTRIBUTE UNIT	REAL TIME (RT) and/or FORECASTED	GEOMETRY/ COVERAGE	TYPE	S-100 REFERENCE
	Traffic and route information	VTS Sailing Plan	VTS area entry (name & positions etc.)	text numbers latitude & longitude bearing & distance	real time and/or forecasted	Area, Point, Line, Curve, 3D (Height,Depth,Width)	DIGITAL	
			VTS area exit (Name & positions etc.)	text numbers latitude & longitude bearing & distance			DIGITAL	
			destination (name, position, berth, quay, anchorage)	latitude & longitude UN LOCODE			DIGITAL	
			route/change of route (waypoints etc.)	text numbers latitude & longitude			DIGITAL	
			arrival (ETA, ATA)	YYYY:MM:DD hh:mm:ss		N/A	DIGITAL	
			departure (ETD, ATD)	YYYY:MM:DD hh:mm:ss		N/A	DIGITAL	

APPENDIX 1 (unchanged)

TEMPLATE FOR A MARITIME SERVICE IN DIGITAL FORMAT

This template should be used by international organizations to describe the maritime services that are within their remit. 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 <i>(incl. measure for quality assurance[‡])</i>	Architect(s)	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

Delete here and include as a new section 10

Description for the harmonized specification of e-navigation technical services

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~~2 The specifications is split into three parts:~~

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- ~~• author of the service specification (organization, contact person).~~

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Another technical VTS service	
Another Maritime service
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7 IALA has developed a detailed Guideline for the specification of e-navigation technical services in accordance with the abovementioned structure and information elements (ref. IALA Guideline G1128). The Guideline is intended for use by engineers and developers that are responsible for making specifications of technical e-navigation services.

APPENDIX 2

Current list of Maritime Services]

Note: To be copied in from NCSR 1/9 and amend as necessary

APPENDIX 3

Specification of each Maritime Service (MS)
