|  |
| --- |
| IALA Guideline |

Gnnnn

Guideline on VTS Digital Communications - draft 2022-09-22

Edition x.x

Date (of approval by Council)

urn:mrn:iala:pub:gnnnn

Revisions to this document are to be noted in the table prior to the issue of a revised document.

|  |  |  |
| --- | --- | --- |
| Date | Details | Approval |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

1. INTRODUCTION 6

2. DOCUMENT PURPOSE 6

3. DOCUMENT STRUCTURE 6

4. PART a general principles of vts digital communications 6

5. part b message structure and delivery 6

5.1. Technical services 7

5.1.1. Voyage Information Service 7

5.1.2. Meteorology Service 7

5.1.3. Meteorological warnings Service 7

5.1.4. Hydrographic Service 7

5.1.5. AtoN information Service 7

5.1.6. Navigational warning service 7

5.1.7. Route Information Service 7

5.1.8. Slot management Service 7

5.1.9. Traffic clearance Service 7

5.1.10. Anchorage assignment Service 7

6. PART C Standard *'DIGITAL'* phrases 7

7. part D current technologies used for the exchange VTS information 7

7.1. IALA GUIDELINEs 7

7.2. IHO 8

7.3. IEC 8

7.4. IMO 8

8. DEFINITIONS 8

9. abbreviations 8

10. references 8

11. Further reading 9

12. Index 10

List of Tables

Table 1 Example of table with row headers 5

Table 2 Example of table with column headers 5

List of Figures

Figure 1 Example of wrapping in line with text 4

Figure 2 Example of wrapped square 5

Figure 3 Example of how to achieve right justified equation number 7

# INTRODUCTION

# DOCUMENT PURPOSE

High level principles for the development of the guideline:

* Operational Guideline
* For different levels of automation
  + focus on situations where human is in the loop
* Focus on the digital information exchange between VTS and vessels, incl. ROC
  + allied services not included
  + FAL - Port Call reports not included
* Use of concrete use-case examples, similarly as in GL 1132
* Focus on current technologies and available specifications
  + Giving concrete examples of current best practices, e.g AIS ASM messages, UKC systems, advance reporting.
* No detailed system requirements.

# DOCUMENT STRUCTURE

This document consists of four parts:

* Part A sets out the general principles for digital communications;
* Part B provides more general guidance on message composition, delivery and interpretation
* Part C provides guidance to establish globally harmonized standard 'digital phrases for interactions
* Part D identifies a number of current technologies used to exchange VTS information

# PART a general principles of vts digital communications

## Managing a mix of traditional VHF voice, digital communications, and automated data exchange

While VTS interaction with ships has traditionally almost exclusively been via VHF voice communications it is expected that digital communications will largely be replace VHF voice in the future, for between shore and ship and ship control centres.

The number of digital services can variate from VTS to VTS. Information on the available digital services from each VTS should be available to the mariners. The digital services should also be discoverable by on-board navigation systems.

Today VTS communication and interaction with ships and allied services is currently almost exclusively undertaken by traditional VHF voice communications.

In addition to VHF voice communications VTS can provide digital communication. Today some of the vessel participating in the VTS will be able to use digital services, but in addition there will vessels that can only use VHF communications with the VTS. VTS must ensure that all vessels get the required information regardless of the communication capabilities of the vessel.

Messages can be conveyed to an individual ship or all ships by either vhf voice, digitally or via data exchange.

The key safety measures are to assist and easy decision making on-board.

The use of digital communication could reduce workload by automating repetitive tasks, which could lead to reduction of the VHF traffic, communication barrier and the risk of misunderstandings.

Digital communications will be effective, timely and consistent always making relevant information available for navigators.

Increasingly, there is a move for communication and interaction to be digital and, in many situations, utilising automated processes. This not only includes person-to-person but also person-to-machine, machine-to-machine and machine-to-person.

The use digital communications will also make the same information available to all actors reducing the need to send the same information several times.

The digitalisation of information will diversify the communication means between shore authorities and vessels and will affect VTS procedures regarding exchange 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. A VTS should remain the primary contact with vessels for urgent and important messages, and to ensure communications with mariners. To mitigate emergency situations and to ensure the safety of life at sea the use of VHF voice communications will be required in addition to digital communications.

Not all vessels are capable of processing voice communications (i.e. MASS level 4). Provisions should therefore be made to ensure that these vessels are receiving the information they require by other means.

## The intent of messages.

The intent of messages conveyed to actors should be the same, irrespective of whether it is by voice or digital means.

The added benefit of digital communication is having the information in standardised structure, ensuring that the same information is available to all actors when required and designed in a way to minimise misinterpretations and to provide common situational awareness. This includes machine-to-machine communications between VTS, vessels and other external sources.

VTS should ensure that it is aware which vessels have received information provided digitally.

The digital services should have up-to -date information.

Digital communications should have the same procedures as the voice communications. Digital communication should be processed the same way as voice communications, acknowledgement of the messages might be needed in some cases, especially in safety critical situations.

# part b message structure and delivery

Tier levels?

* level 1, general information messages. Machine-to-machine communications, no acceptance or action required.
* level 2, information related to one or group of vessels, acknowledgement required.
* level 3, information related to one or group of vessels, acknowledgement and action required.

Thing for consideration:

* Closed loop, when it is needed and how it will be achieved?

Different statuses: 1. received, 2. read, 3. comply

* Ambiguous terminology, differences in speech and text information
* Use of message markers in textual information?
* Differences between regular messages and warning/caution messages - different layers of prioritised messages
* e.g. Geographical positions should always be given in degrees and minutes or in degrees, minutes and decimal minutes in the form:

*Latitude: DD-MMN or DD-MMS Longitude: DDD-MME or DDD-MMW*

*or*

*Latitude: DD-MM.mmN or DD-MM.mmS Longitude: DDD-MM.mmE or DDD-MM.mmW*

*e.g. 07-08N 039-17W 32-18.65S 165-02.81E*

* AIS text messages structure

## Technical services

This section will include the operational descriptions and use cases for the potential technical services identified in the description for Maritime Service for VTS.

If needed further technical services can be added.

Consideration should also be on the timeframe when the services can be implemented, including the potential use of intermediate solutions before standardised technical services, based on S-100 product specifications, are available.

### Voyage Information Service

### Meteorology Service

### Meteorological warnings Service

### Hydrographic Service

### AtoN information Service

### Navigational warning service

### Route Information Service

### Slot management Service

### Traffic clearance Service

### Anchorage assignment Service

# PART C Standard *'DIGITAL'* phrases

to establish globally harmonized standard 'digital phrases for interactions.

# part D current technologies used for the exchange VTS information

## IALA GUIDELINEs

G1081 Provision of virtual Aids to Navigation

G1155 The development of a description of a Maritime Service in the context of e‐ navigation

G1157 Web service based S-100 data exchange

G1143 Unique identifiers for maritime resources

## IHO

S-100 …

[S-127, S-129?]

## IEC

IEC 63173-2 Secure exchange and communication of S-100 based products (SECOM)

## IMO

SN.1/Circ.289 Guidance on the use of AIS application-specific messages

# DEFINITIONS

The definitions of terms used in this Guideline can be found in the *International Dictionary of Marine Aids to Navigation* (IALA dictionary) at <http://www.iala-aism.org/wiki/dictionary> and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

# abbreviations

This section should be typed with the **Abbreviations** style. The acronym or initialism is typed and then tab is pressed so that the style inserts the appropriate tabs and paragraph spacings e.g.:

NGO Non-governmental organization

VTS Vessel Traffic Services

The list should be typed in alphabetical order. The text automatically aligns as an indented paragraph until carriage return is hit and then the next term can be entered.

# references

References are sources directly referred to in the running text and should be given a sequential number, starting at 1. The reference number should be included as close to the referenced text as possible and included as a number within square brackets.

The reference should be listed in the References section in the following syntax using the **Reference** **list** style:

[Author surname,] <space> [initial.] <space> [year] <space> [title.]

For example:

“Hawking also suggests ways that quantum mechanics can be combined with the theory of special relativity [1]. This text builds on his discussion of the instability of black holes described in *A Brief History of Time* [2].”

should be included in the reference list as follows:

1. Hawking, S. (2001) The Universe in a Nutshell.
2. Hawking, S. (1988) A Brief History of Time.

The **Reference list** style will add a number for the reference as soon as you start typing the text and the paragraph will automatically align with the first line of text. Press return to enter a new reference in the list.

# Further reading

Any texts that are recommended to the reader without direct reference in the text should be listed within this section using the same syntax as the reference list. Sources should be listed using the **Further reading** style.

1. Einstein, A. (1905) Relativity: The Special and General Theory of Relativity
2. Idle, E. (1984) The Galaxy Song

# Index

**No index entries found.**

1. Draft Use Cases FOR technical services

The following use cases are examples to provide input for the development of technical service specifications (WG2).

General descriptions on exchange of routes in the S-421 format in described in the Annex of S-421 description in detail.   
  
The below Use Cases include examples of data needed, consult document *VTS51-9.1.6.1 - Appendix 1, MS 1 - 3, Information requirements* for further possible datasets needed.

**Use Case 1**

Use-case (name): Pre-arrival route reporting

Description: Vessel sends prior to its arrival the intended route through the VTS area to the VTS. VTS validates the intended route or sends a recommended route to the vessel. Vessel approves the recommended route.

Actors: Vessel, ECDIS/other on board systems , VTS

Frequency of Use: Typically triggered before or when entering VTS area.

Pre-conditions: The service instance is known to the ECDIS/ECS, or the ECDIS/ECS has access to a service registry in which the service instance can be discovered.

Ordinary Sequence:

1. The route is planned in ECDIS/ECS by the mariner
2. The ECDIS sends intended route, which includes the schedule[including ETA] , to VTS
3. VTS validates the route
4. If the route is recommendable, VTS acknowledges the received route
5. If the route deviates from recommendations, VTS sends new recommended route to the ECDIS/ECS, including justified reason for the changes.
6. The new recommended route is accepted or denied on-board
7. The data is rendered and displayed to the user.

Post-conditions: The vessel's intended route is incorporated in the VTS system.

If the route cannot be agreed, VTS operator contacts the vessel by VHF.

**Use Case 2**

Use-case (name): Pre-arrival / arrival notification

Description: Vessel sends pre-arrival report with information relevant to the VTS/destination

Actors: Vessel, ECDIS/other on board systems , VTS

Frequency of Use: Typically triggered once or when the information changes.

Pre-conditions: The service instance is known to the on-board system, or the on board system has access to a service registry in which the service instance can be discovered.

Ordinary Sequence:

1. The on-board system requests reporting requirements from the VTS
2. The VTS provides the requirements automatically, including what are the mandatory elements
3. On-board system compiles the information required
4. On-board system sends the report with all of mandatory information to VTS
5. VTS validates the information
6. In case of failure VTS asks for revised information
7. if succeeded, VTS acknowledges the received report

Post-conditions: The status of vessels report, and validated reporting information is incorporated in the VTS system and if needed shared to other stakeholders.

**Use Case 3**

Use-case (name): Retrieve VTS Navigational Information.

Description: When entering the VTS area ship-user requests navigational information from the VTS using ECDIS/ECS.

Actors: Mariner, ECDIS/ECS, VTS

Frequency of Use: Typically triggered before vessel enters VTS area or leaves berth and the information is updated until leaves the VTS area.

Pre-conditions: The service instance is known to the ECDIS/ECS.

Ordinary Sequence:

1. The vessel enters VTS area.
2. The ECDIS/ECS requests VTS navigational information from the service.
3. The service directly answers the request with timely and relevant information on factors that may influence the vessel's movements during the passage in the VTS area.

Information elements may include:

1. Navigational warnings
2. Navigational situations (including traffic and route information)
3. Status on AtoN's
4. VTS traffic image of vessels and their movements in a VTS area
5. Restrictions and limitations along in the fairways (UKC, Restricted area, speed limits)
6. Changes in the delivery of other services (pilots, tugs, ports)
7. VTS receives acknowledgement that information is received by the vessel
8. The data is rendered and displayed to the user on board.
9. When information changes VTS sends update to the ECDIS/ECS

Post-conditions: The correct VTS navigational information is displayed on the ECDIS/ECS.

**Use Case 4**

Use-case (name): Retrieve VTS Meteorological Information.

Description: Ship based user requests meteorological information from the VTS using ECDIS/ECS.

Actors: Vessel, ECDIS/other on board systems, VTS

Frequency of Use: Typically triggered once before vessel enters VTS area or leaves berth and the information is updated until leaves the VTS area.

Pre-conditions: The service instance is known to the ECDIS/ECS.

Ordinary Sequence:

1. The vessel is approaching the VTS area or is leaving the berth.
2. The ECDIS/ECS requests VTS meteorological information from the service.
3. The service directly answers the request with timely and relevant information on meteorological and/or hydrological conditions in the VTS area.

Information elements may include:

1. Meteorological: wind, visibility, temperature etc.
2. Meteorological warnings
3. Hydrographical; tide, water level, waves etc.
4. VTS receives acknowledgement that information is received by the vessel
5. The data is rendered and displayed to the user.
6. When information changes VTS sends update to the ECDIS/ECS

Post-conditions: The correct VTS meteorological information is displayed on the ECDIS/ECS.

**Use Case 5**

Use-case (name): Retrieve information related to the management of ship traffic.

Description: VTS provides vessel permission to proceed, impose conditions or deny entry.

Actors: Mariner, ECDIS/ECS, VTS

Frequency of Use: Typically triggered once before vessel enters VTS area or leaves berth.

Pre-conditions: The service instance is known to the ECDIS/ECS.

Ordinary Sequence #1:

1. Vessel wants to leave berth
2. The mariner sends ETD through ECDIS/ECS to the service and requests permission to leave berth.
3. VTS sends response which may include conditions on when vessel can leave the berth
4. Service delivers response to ECDIS/ECS
5. The mariner acknowledges revised ETD in ECDIS/ECS and send response to the VTS.

Ordinary Sequence #2:

1. The vessel enters VTS area
2. The ECDIS/ECS requests permission to proceed from the service
3. Vessel's planned ETA is suitable. VTS sends new recommended ETA to ECDIS/ECS of the vessel through the service
4. The mariner acknowledges to reach the ETA in ECDIS/ECS and sends response to the service.
5. New ETA is confirmed by the VTS

Ordinary Sequence #3, including route plan:

1. Vessel wants to leave berth
2. The mariner sends in route plan with schedule through ECDIS/ECS to the service. The schedule includes the planned ETD.
3. VTS sends response which may acknowledge the ETD or include new ETD
4. Service delivers response to ECDIS/ECS
5. The mariner acknowledges revised ETD in ECDIS/ECS and send updated route plan with schedule to the VTS.

Ordinary Sequence #4, including route plan:

1. VTS uses intended route and schedule from prearrival information provided by the vessel
2. Vessel's planned ETA is suitable. VTS sends new updated route plan which includes recommended ETA to ECDIS/ECS of the vessel through the service
3. The mariner acknowledges to reach the ETA in ECDIS/ECS send updated route plan with schedule to the VTS.
4. New ETA is confirmed by the VTS

Post-conditions: The correct traffic management information is displayed on the ECDIS/ECS and VTS equipment

**Use Case 6**

Use-case (name): Risk of grounding

Description: In addition to voice communications, the vessel can be provided with an electronic route recommendation or waypoint.

Actors: Mariner, ECDIS/ECS, VTS

Frequency of Use: Typically triggered when unsafe situation is observed by VTS

Pre-conditions: The available digital communication methods of the vessel is known to the VTS.

Ordinary Sequence:

1. VTS detects a potential grounding situation
2. VTS system will alert the VTS operator about the situation
3. VTS system sends information automatically or triggered by the VTS operator to ECDIS
4. No navigational changes are detected by the VTS, or vessel has not acknowledged information from VTS
5. If the risk of grounding is not avoided, VTS send route recommendation, waypoint or course to the vessel
6. VTS operator will contact the vessel by VHF
7. Vessel alters course and updates its route plan

Post-conditions: Vessel continues voyage safely

**Use Case 7**

Use-case (name): Providing VTS route

Description:

Actors: Mariner, ECDIS/ECS, VTS

Frequency of Use:

Pre-conditions:

Ordinary Sequence:

Post-conditions:

**Use Case 8**

Use-case (name): Regulation violations

Description: VTS send information when vessel violates the rules in the VTS area, such as COLREG 10 and VTS act

Actors: Mariner, ECDIS/ECS, VTS

Frequency of Use:

Pre-conditions:

Ordinary Sequence:

Post-conditions: