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Service Specification for [Digital] VTS Traffic Clearance Service

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# Introduction

This document was produced as part of the work of IALA joint VTS-ENAV task group on development of technical service specifications for VTS. The document is structured according to the IALA Guideline G1128: THE SPECIFICATION OF e-NAVIGATION TECHNICAL SERVICES. The design of the service interfaces was adapted from the standard for Secure communication between ship and shore IEC 63173-2:2022.

## Purpose of the Document

The purpose of this service specification document is to provide a holistic overview of digital VTS Traffic Clearance Service and its building blocks in a technology-independent way, according to the guidelines given in [1]. It describes a well-defined baseline of the service by clearly identifying the service version.

The aim is to document the key aspects of the VTS Traffic Clearance Service at the logical level:

* the operational and business context of the service
  + requirements for the service (e.g., information exchange requirements)
  + involved nodes: which operational components provide/consume the service
  + operational activities supported by the service
  + relation of the service to other services
* the service description
  + service interface definitions
  + service interface operations
  + service payload definition
  + service dynamic behaviour description
* service provision and validation aspects

## Intended Readership

This service specification is intended to be read by service architects, system engineers and developers in charge of designing and developing an instance of the VTS Traffic Clearance Service.

Furthermore, this service specification is intended to be read by enterprise architects, service architects, information architects, system engineers and developers in pursuing architecting, designing and development activities of other related services.

## Inputs from Other Sources

*This section provides an overview of activities, which are dealing with similar topics and lists already finished ones that provided inputs to this activity.’*

To be added reference to Route Based VTS Service Specifications

To be added short references to IEC 63173-1:2021 – S-421, S-211 as well as S-210

# Service Identification

The purpose of this chapter is to provide a unique identification of the service and describe where the service is in terms of the engineering lifecycle.

|  |  |
| --- | --- |
| Name | VTS Traffic Clearance Service |
| ID | urn:mrn:iala:techsvc:vts:tcs  [not official designation, for example only] |
| Version | 0.2 |
| Description | The VTS Traffic Clearance Service specification describes a standardized service implementing the Vessel Traffic Service traffic clearances communication between ship and shore |
| Keywords | VTS, MS1, Traffic Clearance, Ship Traffic Management, S-211, S-421 |
| Architect(s) |  |
| Status | Provisional |

# Operational Context

According to IMO resolution A.1158(32) Guidelines for Vessel Traffic Services one of the purposes of a VTS is to monitor and manage ship traffic to ensure the safety and efficiency of ship movements.

IALA Guideline G1089 Provision of a VTS states that the monitoring and management may include among other things forward planning and prioritization of ship movements to prevent congestion or dangerous situations and improve overall efficiency, establishing a system of traffic clearances and organizing space allocation.

The initial Maritime Service description for MS1 Vessel Traffic Services describes user needs for digital information services for the exchange of VTS information by electronic means between a VTS and vessel. Vessels using MS1 can receive information related to the management of ship traffic in a digital format that can be displayed in the navigational equipment on board. Digital information exchange may apply to elements of vessel traffic management that is not time critical.

Traffic clearance refers to the process of ensuring that there is sufficient space and time for vessels to navigate safely through an area, taking into account other vessels, obstructions, regulatory and environmental factors. The process of traffic clearances includes the use of communication systems to inform mariners about the location and movements of other vessels and potential hazards.

## Present Day Operational Context

One of the main tasks for VTS is to monitor and manage vessel traffic, including establishing a system for traffic clearances. Traffic clearances may be required in situations when a vessel is:

* entering or prior to entering a VTS area.
* departing from a berth or an anchorage within a VTS area.
* entering or prior to a fairway within a VTS area.
* prior to commencing a manoeuvre that may be detrimental to safe navigation.

Traditionally VTS communication and interaction with ships is almost exclusively undertaken by VHF voice communications. The move to digital communications will reduce the amount of VHF communication and provide timely information which will improve safe and efficient ship traffic and pave the way to future machine to machine operations.

System interfaces for digital exchange of information related to ship traffic management are not standardised. This document starts descripting these standardisations with use cases.

## Envisioned Operational Context

A more digitally- envisioned operational clearance system will provide several valuable benefits to improve communication and with that safety, efficiency and sustainability. Digital systems will enhance situational awareness for the vessel and provide real-time information and help to ensure that all parties timely have the necessary information to make informed decisions and take appropriate actions. This service paves the way for more automated services and decision support tools. Remark: To be added: Prerequisites and assumptions for the minimum use cases. For example relationship to the route exchange.

For effective Traffic Clearance service VTS requires the knowledge of vessels intentions. The primary means to share vessels ETA and ETD times would be the sharing of vessels route plans, including schedule. If the vessel is not capable of sharing route plans, the alternative mean would be sharing only ETA and ETD times and destination of vessel. It should be ensured that the times in the different systems are aligned.

This service specification does not define the on-board systems used in for traffic clearance service. When implementing the Traffic clearance service, it should also planned on which on-board system the service will be aimed at.

It should be noted that if ECDIS will be used as an on-board the system should be compatible with the performance standards for ECDIS. IMO is currently working on the update for ECDIS PS to support the exchange of route plans. At the time of writing of this document ECDIS PS does not support the exchange of ETA/ETD timestamps, which limits the use of only timestamp-based systems to back bridge systems on-board.

The service is based on standardized structured data format, that will enable the exchange of information related to traffic clearances in the VTS area.

A typical voyage through VTS area can be defined by three general use cases: entering VTS area, passing through a VTS area or departing from a berth or anchorage within a VTS area.

The following general use cases provide examples for the digital information exchange between VTS and vessels using traffic clearance service:

Use Case 1 - Departing vessels

1. Vessel wants to leave berth/anchorage
2. The vessel sends route plan, with schedule through its system to the service and requests traffic clearance to leave berth/anchorage
3. VTS sends acknowledgement, updated RTD or denial which may include additional information on when vessel can leave the berth/anchorage
4. Service delivers response to the vessel
5. The vessel acknowledges revised ETD and sends response to the VTS

Use Case 2 - Arriving vessels

1. The vessel enters VTS area
2. The vessel sends route plan, with schedule through its system to the service and requests traffic clearance to proceed to the predefined area from the service
3. If vessel's planned route and ETA is suitable, then VTS send acknowledgement
4. If vessel's planned route or ETA is not suitable, VTS sends new recommended RTA to the vessel through the service
5. The vessel acknowledges revised ETA and sends response to the VTS
6. New ETA is confirmed by the VTS

Use Case 3 - Passing through VTS area

1. The vessel enters VTS area
2. The vessel sends route plan, with schedule through its system to the service and requests traffic clearance to proceed through the VTS area from the service
3. If vessel's planned route and schedule is suitable, then VTS send acknowledgement
4. If vessel's planned route or schedule is not suitable, VTS sends new recommended RTA to the vessel through the service
5. The vessel acknowledges revised ETA and sends response to the VTS
6. New route plan and schedule is acknowledged by the VTS

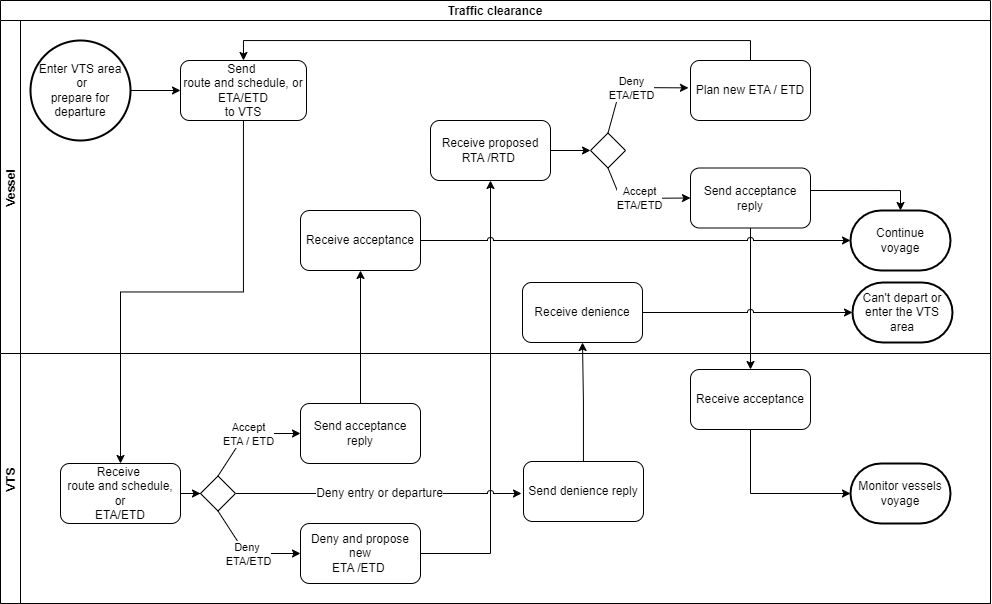


Figure 1: Traffic clearance dataflow

## Functional and Non-functional Requirements

The table below lists applicable existing requirements for the Traffic Clearance service.

Table 1: Requirements Tracing

|  |  |  |  |
| --- | --- | --- | --- |
| Requirement Id | Requirement Name | Requirement Text | References |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Functional requirements

|  |  |
| --- | --- |
| Requirement Id | TCSF001 |
| **Requirement Name** | Receive ETA from vessel |
| **Requirement Text** | A vessel must be able to send its estimated time of arrival (ETA) to the service. The service must have the ability to forward the received ETA to the VTS System. |
| **Rationale** | Sending the ETA of the vessel to the service is a core requirement of the service. In most cases the ETA sent will be the ETA to port, but it could be any ETA that is needed to communicate between the vessel and VTS. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF002 |
| **Requirement Name** | Receive ETD from vessel |
| **Requirement Text** | A vessel must be able to send its estimated time of departure (ETD) to the service. The service must have the ability to forward the received ETD to the VTS System. |
| **Rationale** | Sending the ETD of the vessel to the service is a core requirement of the service. In most cases the ETD sent will be the ETD from port, but it could be any ETD that is needed to communicate between the vessel and VTS. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF003 |
| **Requirement Name** | Send ETA proposal to vessel from VTS |
| **Requirement Text** | The service must facilitate the sending of an ETA proposal from VTSs to the vessel. The proposal may be a part of a rejection of an ETA request from a vessel or standalone. If the proposal is a part of a rejection, the rejection message must be identified. |
| **Rationale** | When VTS personnel are either reviewing a sent ETD from a vessel or trying to organize traffic and need to suggest an ETD to a vessel the service must be able to send an ETD proposal to the vessel. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF004 |
| **Requirement Name** | Send ETD proposal to vessel from VTS |
| **Requirement Text** | The service must facilitate the sending of an ETD proposal from VTSs to the vessel. The proposal may be a part of a rejection of an ETD request from a vessel or standalone. If the proposal is a part of a rejection, the rejection message must be identified. |
| **Rationale** | When VTS personnel are either reviewing a sent ETD from a vessel or trying to organize traffic and need to suggest an ETD to a vessel the service must be able to send an ETD proposal to the vessel. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF005 |
| **Requirement Name** | Approve ETA/ETD from vessel |
| **Requirement Text** | The service must facilitate the sending of the acceptance of the ETA/ETD from the vessel without the need to negotiate the time. The approval may also include a new or changed location to which the ETA/ETD is defined. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF006 |
| **Requirement Name** | Send ETA / ETD proposal from VTS to vessel |
| **Requirement Text** | It will be possible for VTSO to send new proposed estimated time of arrival (ETA) and/or estimated time of departure (ETD) to the vessel |
| **Rationale** | Even before the vessel communicates its ETA or ETD, there must be the ability to communicate a proposal from VTS to a vessel. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF007 |
| **Requirement Name** | Send acknowledgement from vessel to VTS |
| **Requirement Text** | After receiving a suggested ETA/ETD from VTS to the vessel the mariner must be able to either accept the proposal and thus send an immediate acknowledgement to VTS or propose a new ETA/ETD to VTS. |
| **Rationale** | The negotiation process for a new proposed ETA/ETD may include several phases of proposed times and new counterproposals. However a final acknowledgement must also be a part of the process so that VTS knows when vessel has approved the suggested ETA/ETD. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF008 |
| **Requirement Name** | Service integration with VTS System (vessel traffic management information system) |
| **Requirement Text** | The service must integrate with the VTS System so that the information received from vessels can be utilized by the VTS System. |
| **Rationale** | The exact details of how this requirement are fulfilled are left to each implementor as they depend on the functionalities of the VTS System itself. In some cases, it may be better for the VTS System to poll the service, in other cases an event may be triggered, or a simple API call on the VTS System may be used. From the perspective of this specification the implementation details of how the service integrates with the VTS System can be left open. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF009 |
| **Requirement Name** | Service must support event-based communication |
| **Requirement Text** | For best possible compatibility with planned platforms service must be compatible with event driven. |
| **Rationale** | The event driven approach mimics the approach of MMS. MMS with its agents and edge routers abstracts much of the complexity of the challenges faced with ship to shore communication. An event driven approach is also architecturally different from a push/pull API-based approach. By supporting both approaches the services are as future proof as can be at the current stage. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF010 |
| **Requirement Name** | Service must support API based communication |
| **Requirement Text** | Service should offer APIs for direct communication for SECOM style push/pull communication. |
| **Rationale** | Direct API communication enables many ways of interaction with the service. The interfaces defined for the API communication do not require SECOM-style implementations, but the design of the APIs is based on the requirements of SECOM. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSF011 |
| **Requirement Name** | Messages should be signed |
| **Requirement Text** | The service provider and consumer should sign all messages to better enable verification of the communicating parties. |
| **Rationale** | While both approaches typically allow both signed and unsigned communication, preferring signed communication enables easier verification and makes it harder to spoof sources of communication. |
| **Author** |  |

Non-functional requirements

|  |  |
| --- | --- |
| Requirement Id | TCSNF001 |
| **Requirement Name** | Authenticity |
| **Requirement Text** | The recipient of information must be able to verify the authenticity of the received datasets. The IDSec tools and identity registry specified in MCP must be used to facilitate this. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSNF002 |
| **Requirement Name** | Integrity |
| **Requirement Text** | It must be clear to both service provider and consumer whether changes have been made to the information after the dataset was created. All messages must be signed with the correct certificates so that the contents of a message can be validated. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSNF003 |
| **Requirement Name** | Availability |
| **Requirement Text** | The service must always be available with the ability defined by Owner of the service the to deliver traffic clearance information to its consumers. |
| **Rationale** | The service must be available based on the VTS Service hours and service levels. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSNF004 |
| **Requirement Name** | Performance – timeliness |
| **Requirement Text** | The service must provide a response to an incoming request instantly. This response is by necessity a technical delivery acknowledgement and not a business process response. This applies both to requests coming from vessels and VTS System. |
| **Rationale** | Especially from a vessel’s point of view it is important to get an acknowledgement that the service has received a request so that the vessel’s system does not need to try resending the request. |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | TCSNF005 |
| **Requirement Name** | Reliability |
| **Requirement Text** | The service must provide a retry mechanism to ensure that messages are delivered to the vessel or VTS System even if the first request fails. |
| **Rationale** | As the service is effectively a proxy between the VTS System and vessel’s systems it is vital that message delivery to the real consumer is ensured by retrying sending the message.  This is of increased importance when the vessel is behind an unreliable network connection or the actual data carrier changes during messaging. |
| **Author** |  |

## Other Constraints

### Relevant Industrial Standards

*To be added a table of applicable industrial standards*

### Operational Nodes

The following tables describe the operational nodes of the service.

Table x: Operational Nodes providing the Traffic Clearance service

|  |  |
| --- | --- |
| Operational Node | Remarks |
| **Vessel** | Vessels sailing in a service coverage area. |
| **VTS centres** | VTS centres responsible for a service coverage area. |

### Operational Activities

*Optional. If an operational model exists and provides sufficient details about operational activities, then this section shall include a mapping of the service to the relevant operational activities.*

Table x: Operational Activities supported by the *XYZ* service

|  |  |
| --- | --- |
| Operational Activity | Remarks |
|  |  |

# Service Overview

## Service Interfaces

*The two different approaches (event-based and API-based) require different design level technological choices. Therefore, the interface specifications can’t be part of the technology agnostic service specification for the traffic clearances. This paragraph will be adjusted or completely removed according to the future changes in G1128.*

Communication between ship and service is done either via APIs or an event-based approach. The selection of the respective approach is a service design level decision.

And event-based service is based on an event (or message) driven architecture. All calls are assumed to be asynchronous with only a response receipt given from shore to ship or ship to shore.

In the API based approach the service provider is the ship itself because communication is primarily initiated by the ship and the ship is the primary source of the pushed messages. The consumer in this case is the VTS system.

# Service Data Model

The service must consume a data model that is a direct subset of S-211.

For complete and updated documentation of the S-211 data model refer to the latest S-211 Product Specification which can be found at IALA S-200 Data modelling web site <https://www.iala-aism.org/technical/data-modelling/iala-s-200-development-status/s-211/>

The data transfer between service and consumers MUST always conform to the model displayed below. Fields that are optional are identified with MAY and SHOULD in the descriptions below.

This data model does not define the envelops in which the data is sent between the ship and VTS system or all of the interface parameters. This only defines the subset of S211 data that must be present in the s211SubsetData objects defined in the interfaces.

Kuva, joka sisältää kohteen teksti

Kuvaus luotu automaattisesti

Figure 2: Traffic clearance data model diagram

The description of the data model is as follows:

* Must be one of:
  + portCallIdentifier – MRN and preferred if known.
  + portCode – UN/LOCODE as per standard, used when portCallIdentifier is not available
* vesselId – vessel MRN, IMO SHOULD be preferred, but MMSI MAY also be used.
* messageId – MRN + UUID to uniquely identify the message across systems.
* reportedAt – SHOULD be used as timestamp of message creation.
* reportedBy – SHOULD be used to identify the MRN or other identity of the person sending the message, for audit trails etc
* comment – MAY be used to pass additional information as part of the message for human consumption.
* incomingVoyage / outgoingVoyage – SHOULD be used to identify route the is shared or to ensure that all communication on a single arrival / departure is easily connected to a specific journey. Remark: Should be validated as URI
* administrationState
  + serviceObject – Must be one of: Arrival Anchoring Operation, Arrival Berth, Arrival Portarea, Arrival Vtsarea, Departure Anchoring Operation, Departure Berth, Departure Portarea, Departure Vtsarea, Pilotage, Port Visit, Ready to Sail Operation
  + performingActor – if used, must be MRN of vessel
  + effectiveTime – timestamp of the ETA/ETD being communicated.
  + windowBefore / windowAfter – MAY be used to give relative offset of the window requested / given. In hh:mm format.
  + timeSequence ­– MUST be one of Cancelled, Confirmed, Denied, Requested, or Request Received
  + One of
    - atLocation
      * locationMRN – MRN specifying the point of arrival or departure. This may be changed by VTS / port operator to indicate a recommended location instead of the location sent by ship.
    - betweenLocations
      * toLocation / fromLocation – MRN specifying the point from and to the clearance message refers to.

# Service Interface Specifications

*The Service Interfaces are dependent on the technical design and out of scope of this specification. This paragraph will be adjusted or completely removed according to the future changes in G1128.*

# Service Dynamic Behaviour

This section describes the interactive behaviour of the traffic clearances between ship and shore.

Before the exchange of information is initiated, the service consumer retrieves the identity of the service provider from the service infrastructure and performs authentication procedure. If not authenticated, the service request is rejected. The specific authentication procedure is out of scope of the service specification and is described in the technical designs of this service.

This section will be added later.

# References

| Nr. | Version | Reference |
| --- | --- | --- |
| 1. IALA Guideline G1128 | ED 1.4 | THE SPECIFICATION OF E-NAVIGATION TECHNICAL SERVICES |
| xx.yy | Deliverable abc |
| 1. IALA Recommendation R1023 | ED 1.0 | MARITIME RESOURCE NAMES |
| 1. IHO Standard S-100 | ED 5.0.0 | IHO Universal Hydrographic Data Model  <https://iho.int/uploads/user/pubs/standards/s-100/S-100_5.0.0_Final_Clean_Web.pdf> |
| 1. IEC 63173-2 ED1 | 1.0 | Maritime navigation and radiocommunication equipment and systems –  Data interfaces –  Part 2: Secure communication between ship and shore (SECOM) |
| 1. IALA data model S-211 | 1.0 | IALA Port Call Message Product Specification |

# Acronyms and Terminology

## Acronyms

|  |  |
| --- | --- |
| Term | Definition |
| API | Application Programming Interface |
| MC | Maritime Cloud |
| MEP | Message Exchange Pattern |
| MRN | Maritime Resource Name |
| NAF | NATO Architectural Framework |
| REST | Representational State Transfer |
| SOA | Service Oriented Architecture |
| SOAP | Simple Object Access Protocol |
| SSD | Service Specification Document |
| UML | Unified Modelling Language |
| URL | Uniform Resource Locator |
| VTS | Vessel Traffic Service |
| WSDL | Web Service Definition Language |
| XML | Extendible Mark-up Language |
| XSD | XML Schema Definition |

## Terminology

|  |  |
| --- | --- |
| Term | Definition |
| External Data Model | Describes the semantics of the “maritime world” (or a significant part thereof) by defining data structures and their relations. This could be at logical level (e.g., in UML) or at physical level (e.g., in XSD schema definitions), as for example standard data models, or S-100 based data produce specifications. |
| Message Exchange Pattern | Describes the principles how two different parts of a message passing system (in our case: the service provider and the service consumer) interact and communicate with each other. Examples:  In the Request/Response MEP, the service consumer sends a request to the service provider in order to obtain certain information; the service provider provides the requested information in a dedicated response.  In the Publish/Subscribe MEP, the service consumer establishes a subscription with the service provider in order to obtain certain information; the service provider publishes information (either in regular intervals or upon change) to all subscribed service consumers. |
| Operational Activity | An activity performed by an operational node. Examples of operational activities in the maritime context are: Route Planning, Route Optimization, Logistics, Safety, Weather Forecast Provision, … |
| Operational Model | A structure of operational nodes and associated operational activities and their inter-relations in a process model. |
| Operational Node | A logical entity that performs activities. Note: nodes are specified independently of any physical realisation.  Examples of operational nodes in the maritime context are: Maritime Control Center, Maritime Authority, Ship, Port, Weather Information Provider, … |
| Service | The provision of something (a non-physical object), by one, for the use of one or more others, regulated by formal definitions and mutual agreements. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or through voice communication or written processes and procedures. |
| Service Consumer | A service consumer uses service instances provided by service providers. All users within the maritime domain can be service customers, e.g., ships and their crew, authorities, VTS stations, organizations (e.g., meteorological), commercial service providers, etc. |
| Service Data Model | Formal description of one dedicated service at logical level. The service data model is part of the service specification. Is typically defined in UML and/or XSD. If an external data model exists (e.g., a standard data model), then the service data model shall refer to it: each data item of the service data model shall be mapped to a data item defined in the external data model. |
| Service Design Description | Documents the details of a service technical design (most likely documented by the service implementer). The service design description includes (but is not limited to) a service physical data model and describes the used technology, transport mechanism, quality of service, etc. |
| Service Implementation | The provider side implementation of a dedicated service technical design (i.e., implementation of a dedicated service in a dedicated technology). |
| Service Implementer | Implementers of services from the service provider side and/or the service consumer side. Anybody can be a service implementer but mainly this will be commercial companies implementing solutions for shore and ship. |
| Service Instance | One service implementation may be deployed at several places by same or different service providers; each such deployment represents a different service instance, being accessible via different URLs. |
| Service Instance Description | Documents the details of a service implementation (most likely documented by the service implementer) and deployment (most likely documented by the service provider). The service instance description includes (but is not limited to) service technical design reference, service provider reference, service access information, service coverage information, etc. |
| Service Interface | The communication mechanism of the service, i.e., interaction mechanism between service provider and service consumer. A service interface is characterised by a message exchange pattern and consists of service operations that are either allocated to the provider or the consumer of the service. |
| Service Operation | Functions or procedure which enables programmatic communication with a service via a service interface. |
| Service Physical Data Model | Describes the realisation of a dedicated service data model in a dedicated technology. This includes a detailed description of the data S-211 to be exchanged using the chosen technology. The actual format of the service physical data model depends on the chosen technology. Examples may be WSDL and XSD files (e.g., for SOAP services) or swagger (Open API) specifications (e.g., for REST services). If an external data model exists (e.g., a standard data model), then the service physical data model shall refer to it: each data item of the service physical data model shall be mapped to a data item defined in the external data model.  In order to prove correct implementation of the service specification, there shall exist a mapping between the service physical data model and the service data model. This means, each data item used in the service physical data model shall be mapped to a corresponding data item of the service data model. (In case of existing mappings to a common external (standard) data model from both the service data model and the service physical data model, such a mapping is implicitly given.) |
| Service Provider | A service provider provides instances of services according to a service specification and service instance description. All users within the maritime domain can be service providers, e.g., authorities, VTS stations, organizations (e.g., meteorological), commercial service providers, etc. |
| Service Specification | Describes one dedicated service at logical level. The Service Specification is technology-agnostic. The Service Specification includes (but is not limited to) a description of the Service Interfaces and Service Operations with their data S-211. The data S-211 description may be formally defined by a Service Data Model. |
| Service Specification Producer | Producers of service specifications in accordance with the service documentation guidelines. |
| Service Technical Design | The technical design of a dedicated service in a dedicated technology. One service specification may result in several technical service designs, realising the service with different or same technologies. |
| Service Technology Catalogue | List and specifications of allowed technologies for service implementations. Currently, SOAP and REST are envisaged to be allowed service technologies. The service technology catalogue shall describe in detail the allowed service profiles, e.g., by listing communication standards, security standards, stacks, bindings, etc. |
| Spatial Exclusiveness | A service specification is characterised as “spatially exclusive”, if in any geographical region just one service instance of that specification is allowed to be registered per technology.  The decision, which service instance (out of a number of available spatially exclusive services) shall be registered for a certain geographical region, is a governance issue. |

1. Service Specification XML

*This appendix contains the formal definition of the service specification.*

The Service Specification XML definition will be added at later stage to incorporate changes in G1128.

1. Service JSON schema

As previously noted, this schema is directly mappable to S-211. The root element of PortCallMessage in S-211 has been left out as an unnecessary level of objects in this use case. MRN validation has also been relaxed from S-211 v1.1.0 requirement to allow generic MRNs better allowing reuse of any valid MRN.

{

"$schema": " https://json-schema.org/draft/2020-12/schema",

"$id": "https://docs.maritimeconnectivity.net/schema/1.0.0/vts-tcs/schema.json",

"title": "VTS-TCS",

"description": "Schema for JSON communication between vessel and VTS for communicating traffic clearance. Based on S-211",

"type": "object",

"properties": {

"portCode": {

"description": "portCode is the 5 letter UN/LOCODE of the port this message is pertaining to ",

"type": "string",

"minLength": 5,

"maxLength": 5

},

"vesselId": {

"description": "MRN of vessel",

"$ref": "#/$defs/MRN"

},

"messageId": {

"description": "MRN + UUIDv4 to uniquely identify the message",

"type": "string",

"pattern": "[uU][rR][nN]:[mM][rR][nN]:[iI][pP][cC][dD][mM][cC]:[mM][eE][sS][sS][aA][gG][eE]:[0-9a-fA-F]{8}-[0-9a-fA-F]{4}-4[0-9a-fA-F]{3}-[8-9a-bA-B][0-9a-fA-F]{3}-[0-9a-fA-F]{12}",

"minLength": 59,

"maxLength": 59

},

"reportedAt": {

"description": "Time when a time stamp was reported",

"type": "string",

"format": "date-time"

},

"reportedBy": {

"description": "Entity that reported a time stamp",

"$ref": "#/$defs/MRN"

},

"comment": {

"description": "A freeform comment or message to recipient",

"type": "string"

},

"incomingVoyage": {

"description": "",

"$ref": "#/$defs/MRN"

},

"outgoingVoyage": {

"description": "",

"$ref": "#/$defs/MRN"

},

"locationState": {

"type": "object",

"properties": {

"referenceObject": {

"description": "S-211 defines an enumeration, for TCS use only Vessel is allowed.",

"const": "Vessel"

},

"effectiveTime": {

"description": "The time that is being used as ETA/ETD time",

"type": "string",

"format": "date-time"

},

"windowBefore": {

"description": "Time offset, relative a given time. In hours and minutes (HH:MM)",

"type": "string",

"pattern": "[0-9][0-9]:[0-6][0-9]"

},

"windowAfter": {

"description": "Time offset, relative a given time. In hours and minutes (HH:MM)",

"type": "string",

"pattern": "[0-9][0-9]:[0-6][0-9]"

},

"timeType": {

"description": "The time dimension of a time stamp combined with the state expressing intentions, recommendations or outcomes. TODO this should be defined in a higher level schema. This is a subset of the values allowed by S-211",

"enum": [ "Estimated", "Planned", "Recommended", "Required" ]

},

"timeSequence": {

"description": "The component of a state (as location, service, administrative state) regulating the communicative intent of the state (such as arrived, departed, commenced, completed, requested, request received, confirmed, denied, cancelled). This is a subset of the values allowed by S-211",

"enum": [ "Arrival To", "Departure From" ]

},

"if": {

"properties": { "timeSequence": { "const": "Arrival To" } }

},

"then": {

"properties": {

"toLocation": {

"description": "The arrival location",

"type": "object",

"properties": {

"locationMRN": { "$ref": "#/$defs/MRN" }

},

"required": [ "locationMRN" ]

}

},

"required": [ "toLocation" ]

},

"else": {

"properties": {

"fromLocation": {

"description": "The departure location",

"type": "object",

"properties": {

"locationMRN": { "$ref": "#/$defs/MRN" }

},

"required": [ "locationMRN" ]

}

},

"required": [ "fromLocation"]

}

},

"required": [ "referenceObject", "effectiveTime", "timeType", "timeSequence" ]

}

},

"required": [ "portCode", "vesselId", "messageId", "reportedAt", "locationState" ],

"$defs": {

"MRN": {

"type": "string",

"description": "Marine Resource Name identifier, based on URN. Note that the NID, including the mrn: prefix can be no more than 31 characters long. TODO - this should be defined in a higher level schema.",

"pattern": "[uU][rR][nN]:[mM][rR][nN]:[A-Za-z0-9][A-Za-z0-9-]{0,27}:[A-Za-z0-9()+,-.:=@;$\_!\*'%/?#]+"

}

}

}