IALA Technical Service:

Service Specification for VTS Traffic Clearance

Version 1.3

June 2024

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1 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* [1].

1.1 Purpose of the Document

The purpose of this service specification is to provide a holistic overview of the digital service of VTS Traffic Clearance and its building blocks in a technology-independent way, according to the guidelines given in G1128 **Erreur ! Source du renvoi introuvable.**. 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 use cases
  - service operational sequence
  - logical operations
  - logical data model
  - dynamic behaviour

1.2 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.

1.3 Inputs from Other Sources

When developing this service inputs from *IMO FAL.5/Circ.52 Guidelines for harmonized communication and electronic exchange of operational data for port calls* [2] has been taken into consideration.

2 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 Technical Service*
ID	*urn:mrn:iala:techsvc:ss:vts:tcs:1.3*
Version	*1.3*
Description	*The VTS Traffic Clearance Service specification describes a standardized service implementing the VTS traffic clearances communication between ship and shore.*
Keywords	*VTS, MS1, Traffic Clearance, Ship Traffic Management, S-212, S-421*
Architect(s)	
Status	*Ready for testing*

3 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.

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 entering a fairway within a VTS area;
- deviations with (improved) planned intentions within a VTS area; or
- prior to commencing a manoeuvre that may be detrimental to safe navigation.

The 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 (i.e the ECDIS). Digital information exchange may apply to elements of vessel traffic management that are not time critical.

Traffic clearance is a VTS authorization under conditions specified. The granting, or not granting, of permission to enter, depart or proceed refers to the process of ensuring that there is sufficient space and time for vessels to navigate safely through an area as well as consider other vessels, obstructions, regulatory and environmental factors. Based on the information available, the VTS assesses that it is safe and gives approval for the ship to proceed e.g. from or to a berth or anchorage, subject to the discretion of the Master.

The process of granting permissions includes the use of communication systems to inform mariners about the location and movements of other vessels and potential hazards.

Modern technologies enhance the method of communication in a digital way. Digital communication has advances compared with traditional voice communication. Digital communications enable us to communicate quickly and effectively without the risk for misunderstanding. Digital communication can be used with human interference, but also can be used in automated processes without human interference.

To provide digital communication in globally harmonized way a common understanding of the operational procedures and standardised technical services are necessary.

A more digitally-envisioned operational system for granting permissions 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. Traffic Clearance Service paves the way for more automated services and decision support tools.

For effective Traffic Clearance Service, VTS requires the knowledge of vessels intentions. The primary means to share vessels ETA and ETD would be the sharing of vessels route plans, which always includes a schedule. If the vessel is not capable of sharing a route plan, the alternative mean would be sharing only ETA and ETD 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 the on-board system which the service will be deployed on should also be planned.

It should be noted that if ECDIS will be used as an on-board system, it should be compatible with the performance standards for ECDIS. 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.

This service should be used directly from ship board systems.

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

3.1 Use cases for Traffic Clearance Service

Typical voyages through VTS areas can be defined by general use cases: (UC1) departing from a berth or anchorage within a VTS area, (UC2) entering or passing through a VTS area, entering VTS area to (UC3) take berth or (UC4) head for anchorage and (UC5) a vessel transiting within the VTS area. Next to that (UC6) an external influence could change the Traffic Clearance by VTS or vessel.

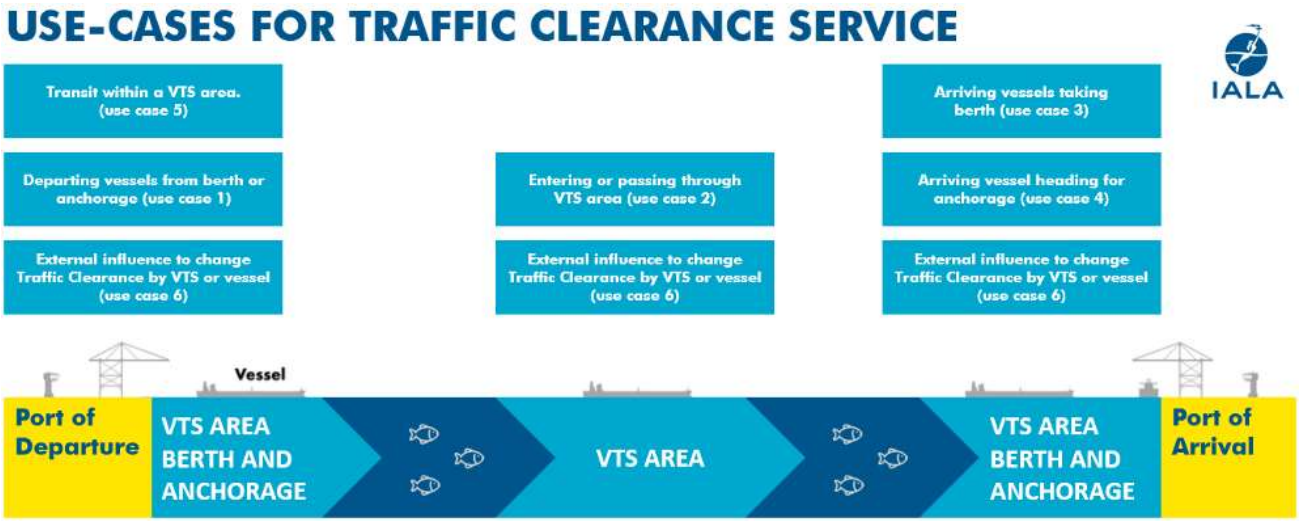

Figure 1 Traffic Clearance Service Use Cases

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

Use Case 1 - Departing vessels from berth or anchorage.

1. Vessel wants to leave berth/anchorage
2. The vessel sends message (ETD) through its system to the service and requests permission to leave berth/anchorage
3. If vessel's schedule is suitable, then VTS send acknowledgement [go to step 7]
4. If vessel's plan (ETD) is not suitable, VTS sends denial or a proposal with recommended information on when vessel can leave the berth/anchorage.
5. Service delivers response to the vessel
6. The vessel acknowledges revised ETD and sends response to the VTS or creates new plan [go to step 2]
7. Berth/anchorage location with ETD are acknowledged by the VTS and sends permission to leave berth/anchorage
8. The vessel leaves berth/anchorage

Use Case 2 – Entering, leaving or passing through VTS area

1. Vessel is about to enter or pass through the VTS area
2. The vessel sends message (ETA) through its system to the service and requests permission to proceed through the VTS area from the service
3. If vessel's planned route and schedule is suitable, then VTS send acknowledgement [go to step 7]

4. If vessel's planned route or schedule is not suitable, VTS sends denial or a RTA to the vessel through the service
5. Service delivers response to the vessel
6. The vessel acknowledges revised ETA and sends response to the VTS or creates new plan [go to step 2]
7. Route with ETA are acknowledged by the VTS and sends permission to proceed through the VTS area
8. The vessel enters the VTS area

Use Case 3 - Arriving vessels taking berth

1. Vessel is about to enter the VTS area
2. The vessel sends message (ETA at berth location) through its system to the service and requests permission to proceed to the predefined berth from the service
3. If vessel's planned route and ETA is suitable, then VTS send acknowledgement [go to 7]
4. If vessel's planned route or ETA is not suitable, VTS sends denial or a RTA to the vessel through the service
5. Service delivers response to the vessel
6. The vessel acknowledges revised ETA and sends response to the VTS or creates new plan [go to step 2]
7. Berth location with ETA are acknowledged by the VTS and sends permission to proceed to berth
8. The vessel enters the VTS area

Use Case 4 – Arriving vessel heading for anchorage

1. Vessel is about to enter the VTS area
2. The vessel sends message (ETA at anchorage location) through its system to the service and requests permission to proceed to the predefined anchorage from the service
3. If vessel's planned route and ETA is suitable, then VTS send acknowledgement [go to 7]
4. If vessel's planned route or ETA is not suitable, VTS sends denial or a recommended plan to the vessel through the service
5. Service delivers response to the vessel
6. The vessel acknowledges recommended plan and sends response to the VTS or creates new plan [go to step 2]
7. Anchorage location with ETA are acknowledged by the VTS and sends permission to proceed to anchorage
8. The vessel enters the VTS area

Use Case 5 – Transiting within a VTS Area.

1. Vessel wants to leave berth or anchorage.

2. The vessel sends message (ETD) through its system to the service and requests permission to leave berth/anchorage head for another berth or anchorage in the area.
3. If vessel's schedule is suitable, then VTS send acknowledgement [go to step 7]
4. If vessel's schedule is not suitable VTS sends a denial or proposal which may include additional information on when vessel can leave the berth/anchorage
5. Service delivers response to the vessel
6. The vessel acknowledges revised ETD and sends response to the VTS or creates new plan [go to step 2]
7. ETD and ETA with location are acknowledged by the VTS and sends permission to leave berth/anchorage and head for the other berth/anchorage
8. The vessel leaves berth/anchorage

Use Case 6 external influence to change Traffic Clearance

1. Approved plan needs changes due to external influences, like weather conditions, delay or occurring hazardous situation
2. VTS or vessel sends request to amend the approved plan
3. Vessel creates new plan and sends new request via Use case 1-5

Figure 2 gives an overview of the dataflows between vessels using the traffic clearance service and VTS.

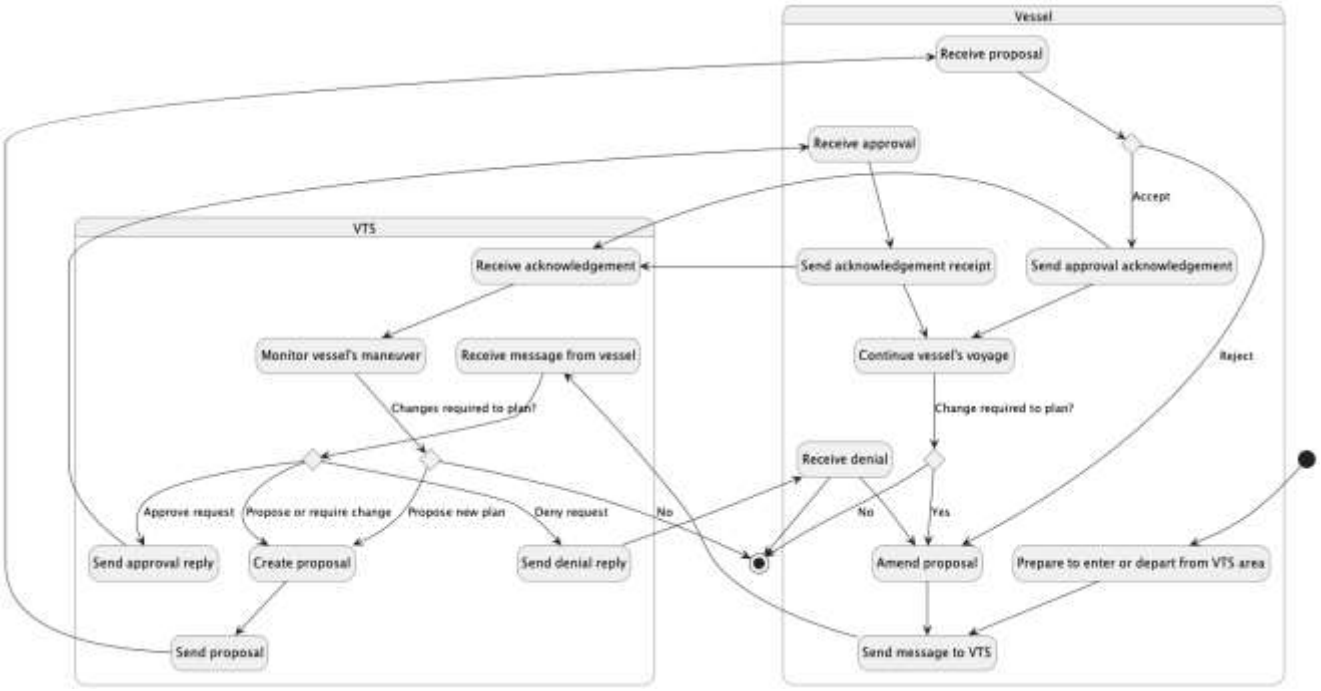

Figure 2: Traffic clearance dataflow

3.2 Functional and Non-functional Requirements

3.2.1 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. The ETA may refer to arrival to VTS area, berth, anchoring or passing through a VTS area and may refer to a named location, moving between named locations or a geographical location referred to with a point, polygon or rectangle.
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. The ETD may refer to leaving from VTS area, berth, anchoring or passing through a VTS area and may refer to a named location, moving between named locations or a geographical location referred to with a point, polygon or rectangle.
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. The ETA may refer to arrival to VTS area, berth, anchoring or passing through a VTS area and may refer to a named location, moving between named locations or a geographical location referred to with a point, polygon or rectangle.
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. The ETD may refer to leaving from VTS area, berth, anchoring or passing through a VTS area and may refer to a named location, moving between named locations or a geographical location referred to with a point, polygon or rectangle.
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 VTS 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	Handle transits within a VTS area
Requirement Text	The system must allow the sending of a single message where a departure and arrival is combined to facilitate transits from one location to another within the VTS area.
Rationale	The normal situation in which this occurs is the transit of a ship from anchorage to berth or berth to berth as required by ship operations or any other source. The important fact to note is that the clearance must take place in a single interaction for both departure and approval.
Author	

Requirement Id	**TCSF009**
Requirement Name	Handle exceptional situations
Requirement Text	When an exceptional situation occurs requiring either VTS or ship to require or request changes to an already approved plan, the system must allow the cancellation or denial of previously approved operation and proposal of new operation in a single message.
Rationale	Exceptional situations must be foreseen, and the service must be dynamic enough to allow changes to already approved plans. By allowing the cancellation/denial of an approved operation and the proposal/requirement of a new operation allows the service to react to unforeseen situations.
Author	

Requirement Id	**TCSF010**
Requirement Name	Service integration with VTS 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 implementer 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	

3.2.2 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 technical designs must describe how this is managed.
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. The technical designs must describe how this is managed.
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 to deliver traffic clearance information to its consumers. The technical designs must describe how this is managed.
Rationale	The service must be available based on the VTS Service hours.
Author	

Requirement Id	**TCSNF004**
Requirement Name	Performance – timeliness
Requirement Text	The service must provide a technical 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. The technical designs must describe how this is managed.
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. The technical designs must describe how this is managed.
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	

3.3 Other Constraints

3.3.1 Relevant Industrial Standards

Nr.	Standard	Version	Reference
1.	IALA Guideline G1128	ED 1.5 (draft)	The Specification of E-navigation Technical Services
2.	IALA Guideline G1143	ED 3.1 June 2021	Unique identifiers for maritime resources (MRN)
3.	IHO Standard S-100	ED 5.0.0 December 2022	IHO Universal Hydrographic Data Model https://iho.int/uploads/user/pubs/standards/s-100/S-100_5.0.0_Final_Clean_Web.pdf
4.	S-212	0.7 (draft)	
5.	IEC S-421	ED 1.0	Route Plan based on S-100 (IEC 63173)

3.3.2 Operational Nodes

The following table describes the operational nodes of the service.

Operational Node	Remarks
Vessel	*Participating ship* that is required to participate with vessel traffic services and is sailing in a VTS area where there is coverage of technical service.
VTS centre	*VTS centre* responsible for a one or several *VTS Areas* for which the *VTS provider* is authorized to deliver vessel traffic services. A VTS centre is responsible for VTS traffic clearance service within its coverage area.

4 Service Overview

4.1 Logical Operations

The following logical operations must be provided in the designs that follow this specification:

Operation	Description	Required	
		Vessel	VTS
Send message	An operation to send a message. Message may be an initial plan, proposal, or a disapproval.	x	x
Receive message	An operation that allows the receiving of messages. When message is received, and acknowledgement must be sent.	x	x
Receive acknowledgement	An operation that allows the reception of an acknowledgement.	x	x

As an example, in a typical HTTP REST-based approach the send message is the HTTP request that sends the message to the recipients HTTP endpoint which serves as the receive operation. The receive acknowledgement can just as easily be the content of the HTTP response that the recipient sends in response to the request. This requires that both the vessel and ship has an HTTP server that has defined endpoints for all operations and can communicate the URLs of these endpoints to each other.

4.2 Logical Parameters

As the logical operations are very abstract the logical parameters and response contents will be described later in the document. Actual parameter structures, response structures or error handling is not specified. These will be defined in more detail in the technical design documents.

5 Service Data Model

The service must consume a data model that is a direct subset of S-212.

For complete and updated documentation of the S-212 data model refer to the latest S-212 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-212/

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 envelopes in which the data is sent between the ship and VTS system or the technical interface parameters. This data model does not consider response acknowledgement messages as they are technology dependent. This only defines the subset of S-212 that must be supported by the service.

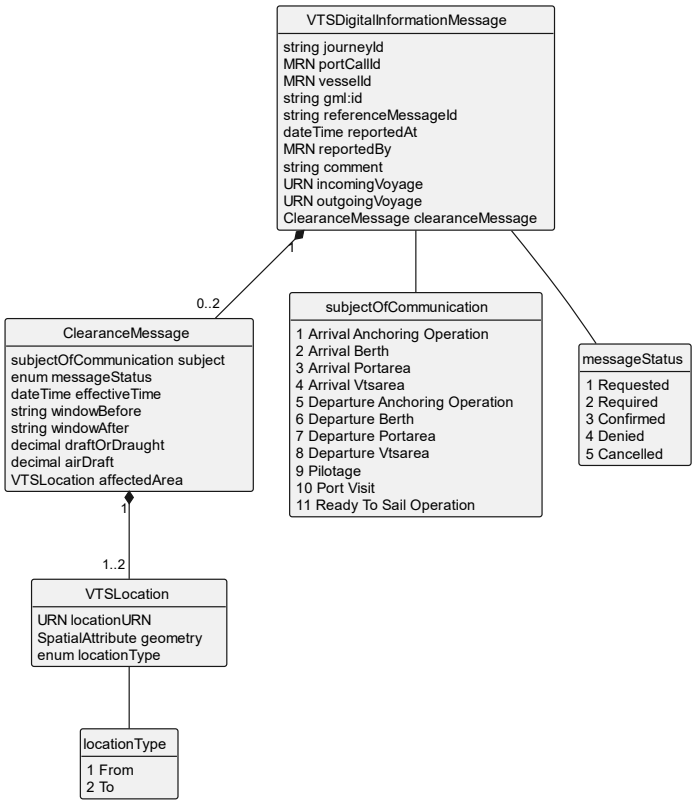

Figure 3: Traffic clearance data model diagram

The description of the data model is as follows:

- Must be one of:
  - portCallId – MRN and preferred if known.
  - journeyId – Only to be used if portCallId is not available. A uuid or similar unique identifier is preferred.

- vesselId – vessel MRN, IMO SHOULD is preferred, but MMSI or any other suitable identifying MRN MAY also be used.
- gml:id – UUIDv4 to uniquely identify the message across systems.
- referenceMessageId – UUIDv4, MUST be used in all messages following the first message and must refer to the message being replied to.
- reportedAt – SHOULD be used as timestamp of message creation. Implementations MAY decline any messages that do not contain this information.
- reportedBy – SHOULD be used to identify the MRN or other identity of the person sending the message, for audit trails etc. Implementations MAY decline any messages that do not contain this information.
- comment – MAY be used to pass additional information as part of the message for human consumption.
- incomingVoyage / outgoingVoyage – SHOULD be used to identify route that is shared or to ensure that all communication on a single arrival / departure is easily connected to a specific journey. When passing through a VTS area incomingVoyage is preferred. MRN is to be preferred, but validation will accept any valid URI.
- clearanceMessage – must occur at least once or at most twice to allow for cancellations and transitions
    - subject – 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
    - 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.
    - draftOrDraught – The vertical distance, at any section of a vessel from the surface of the water to the bottom of the keel. Especially useful for anchorage operations.
    - airDraft – the vertical distance from the highest section of the vessel to the surface of the water.
    - messageStatus – MUST be one of Cancelled, Confirmed, Denied, Requested, or Required
    - affectedArea – 1…2 instances of VTSLocation where
        - one of
            - geometry – allows the following geometry types: GM_Point, GM_Polygon, S100_ArcByCentrePoint, S100_CircleByCentrePoint
            - locationURN – preferably a MRN but may be any valid URN
        - locationType – semantically correct option from enumeration. If two values instances of VTSLocation are present the locationType must be different in both instances.

6 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 message recipient retrieves the identity of the service sender from the service infrastructure and performs an 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. Thus, the following diagrams do not describe these steps.

The following diagrams contain variations of the use cases described above and do not cover every single option of looping through multiple steps of negotiation for the different operations that are supported. They are intended to capture and describe the required changes in the messages that support all of the functionalities that the use cases require.

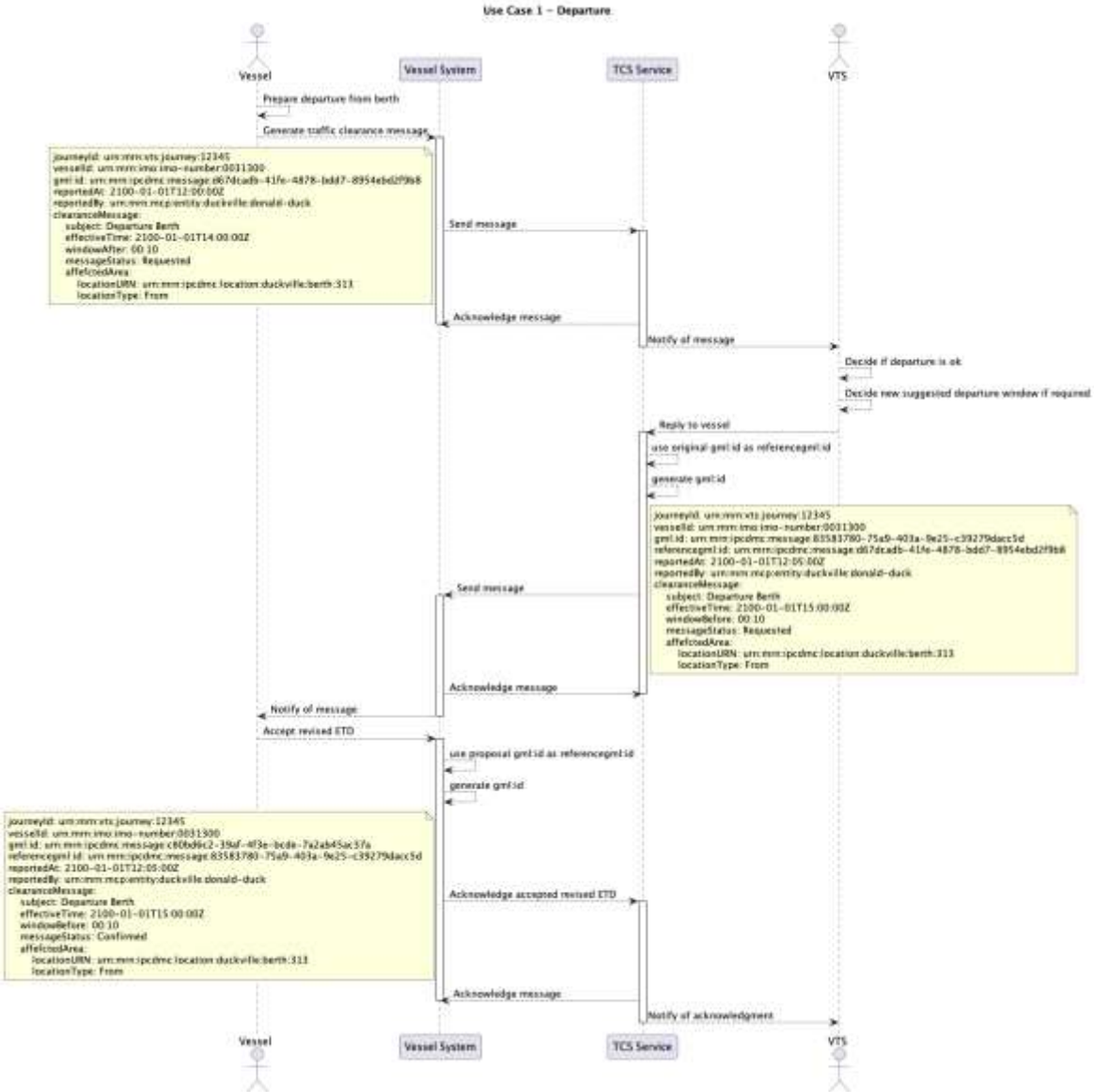

Figure 4 Use Case 1 sequence diagram

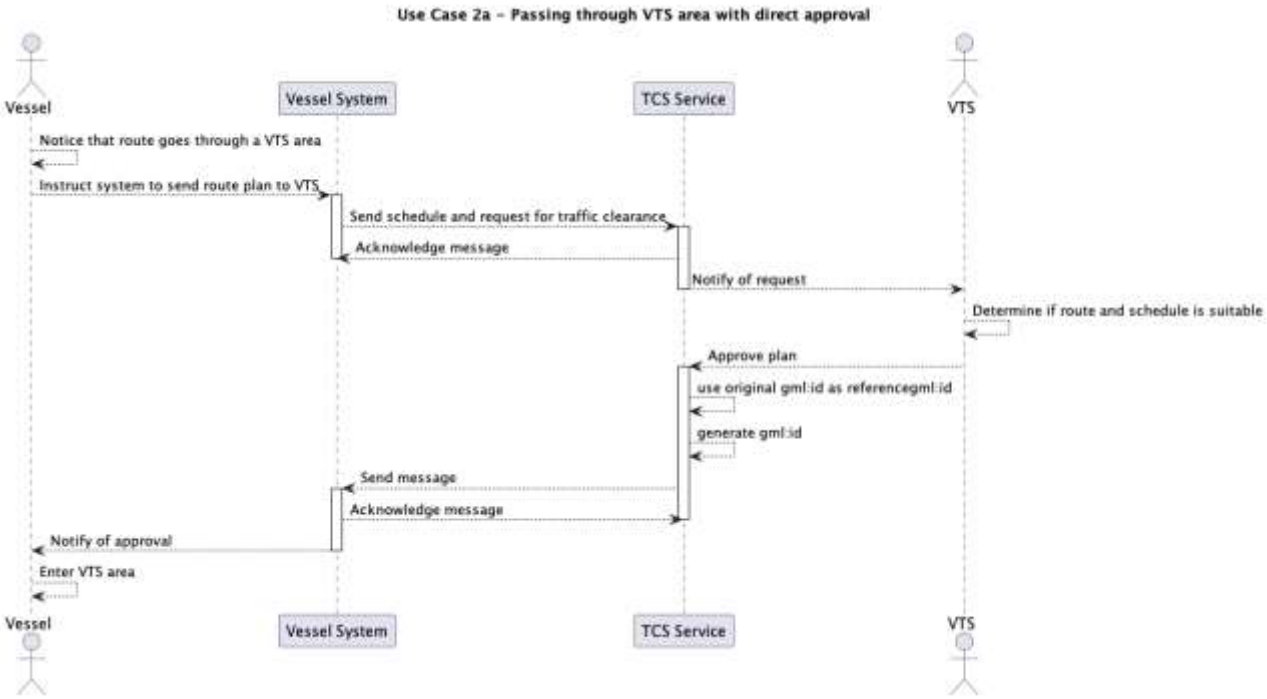

Figure 5 Use Case 2 variation 1 sequence diagram

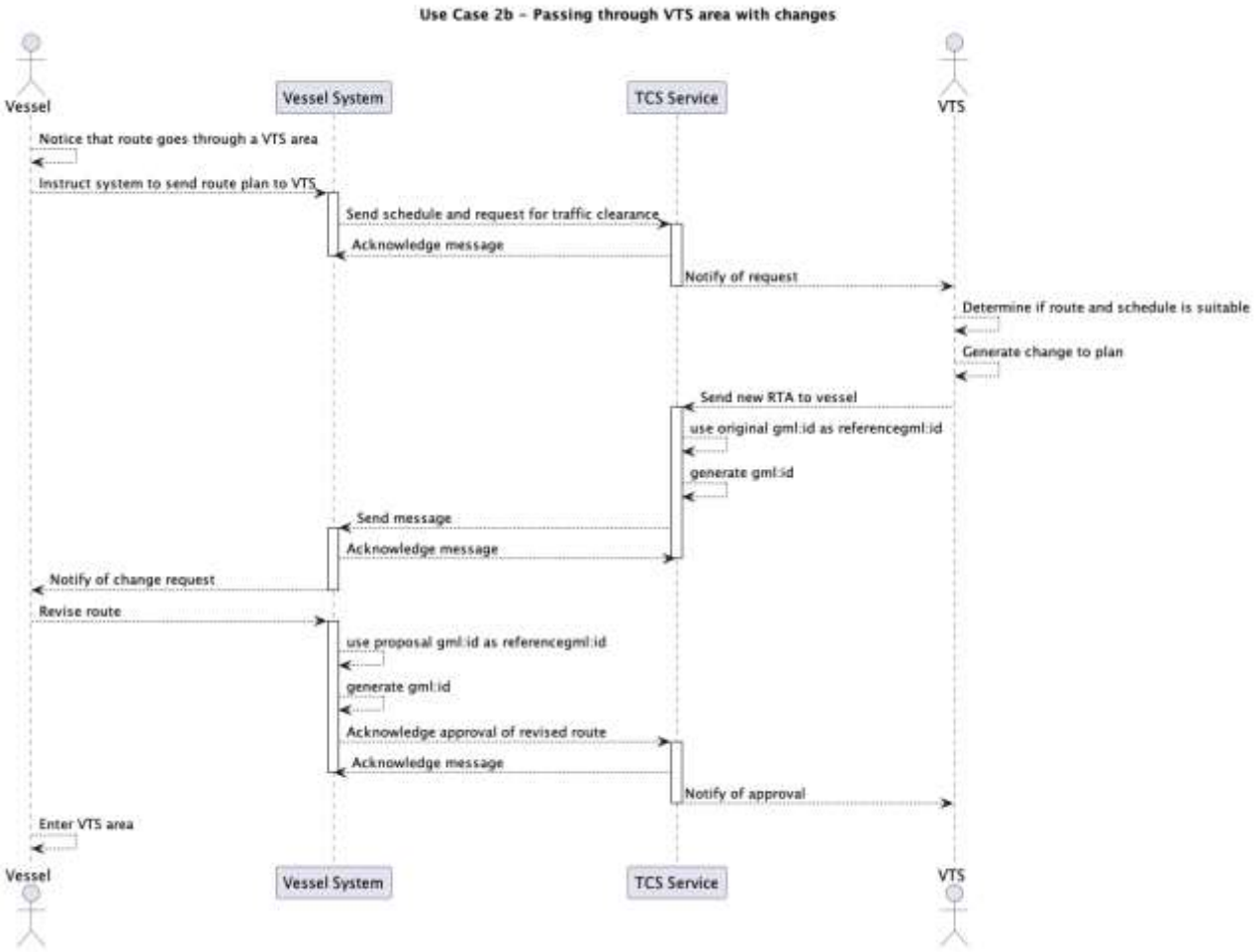

Figure 6 Use Case 2 variation 2 sequence diagram

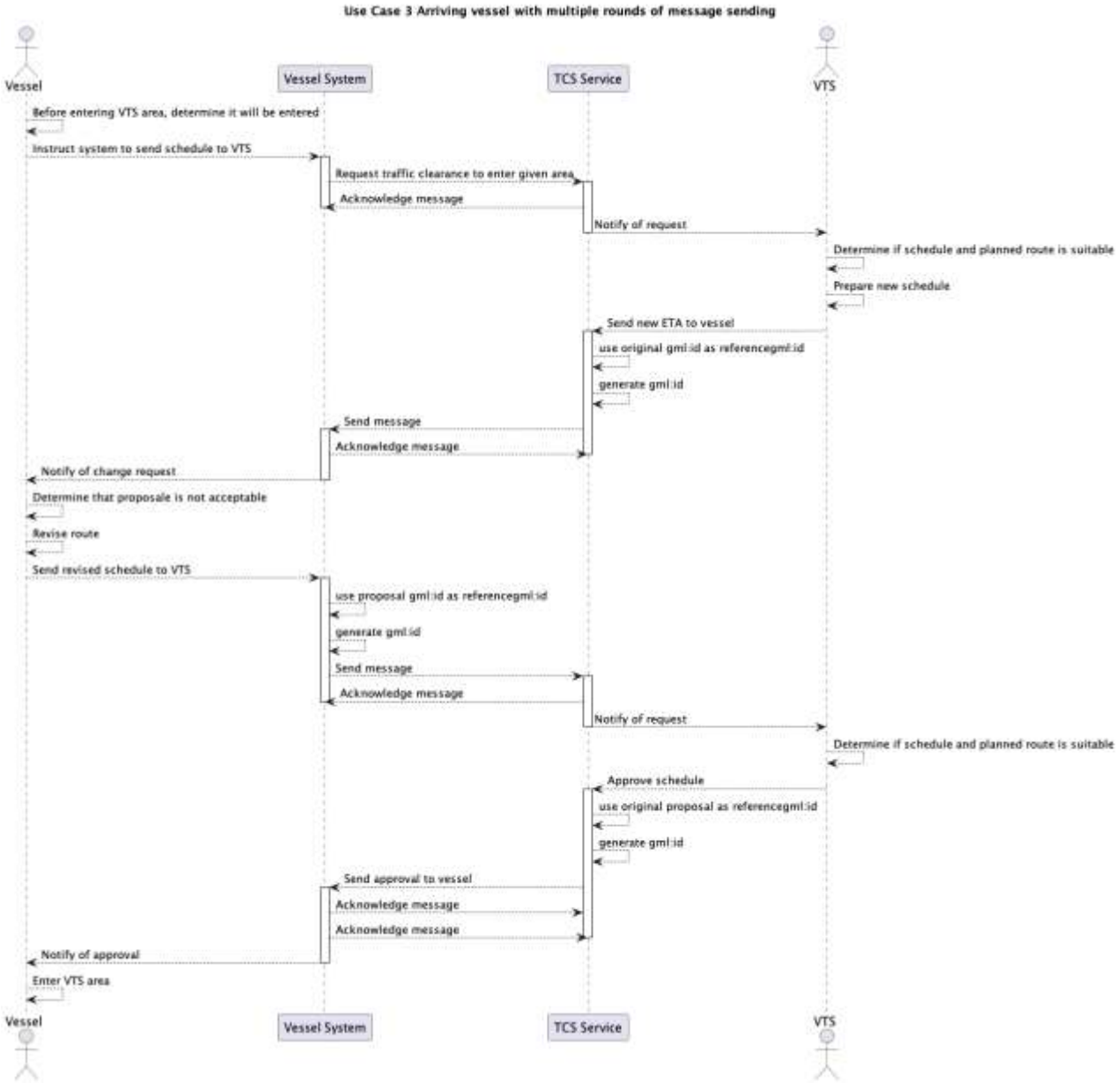

Figure 7 Use Case 3 sequence diagram

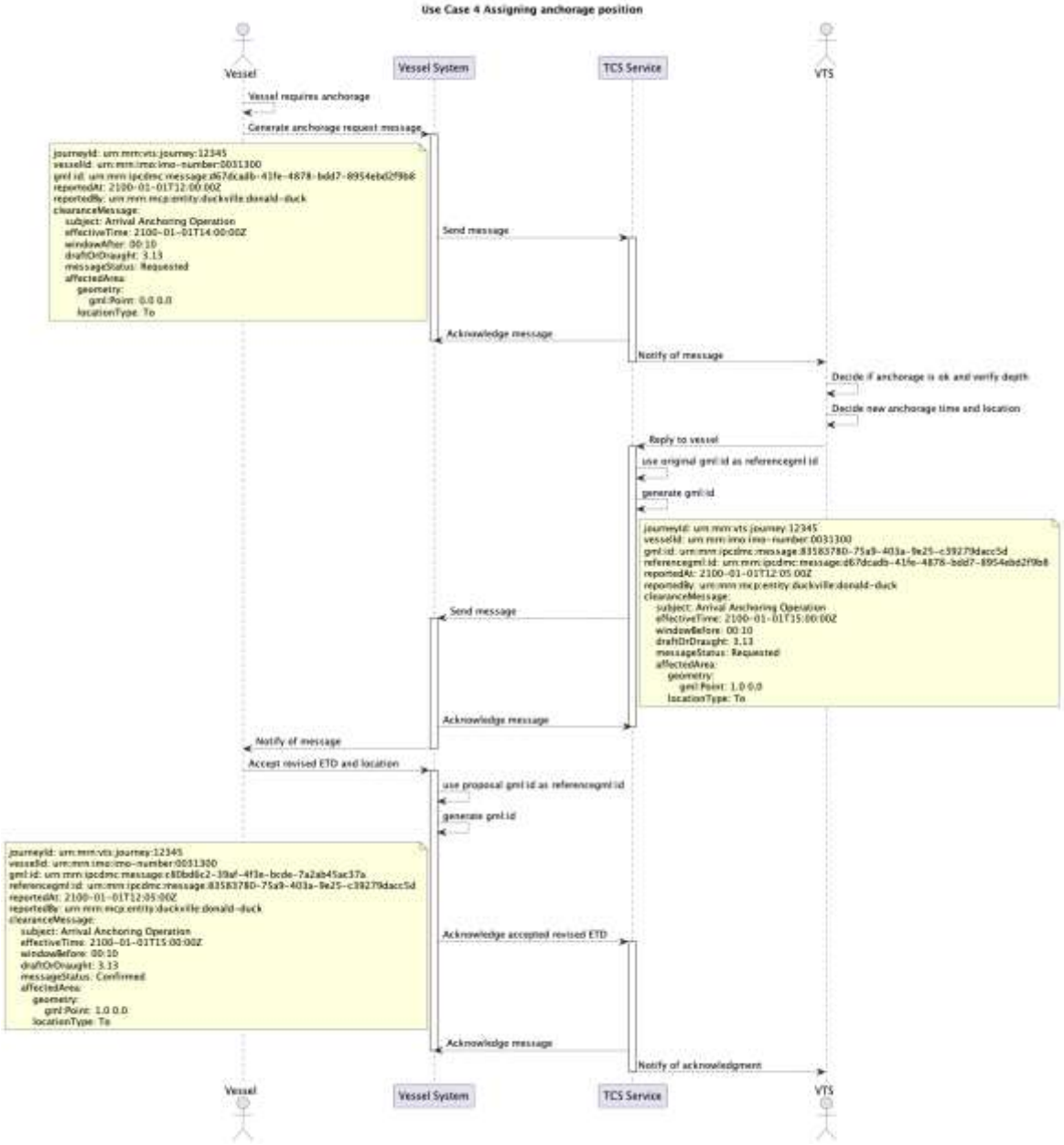

Figure 8 Use Case 4 sequence diagram

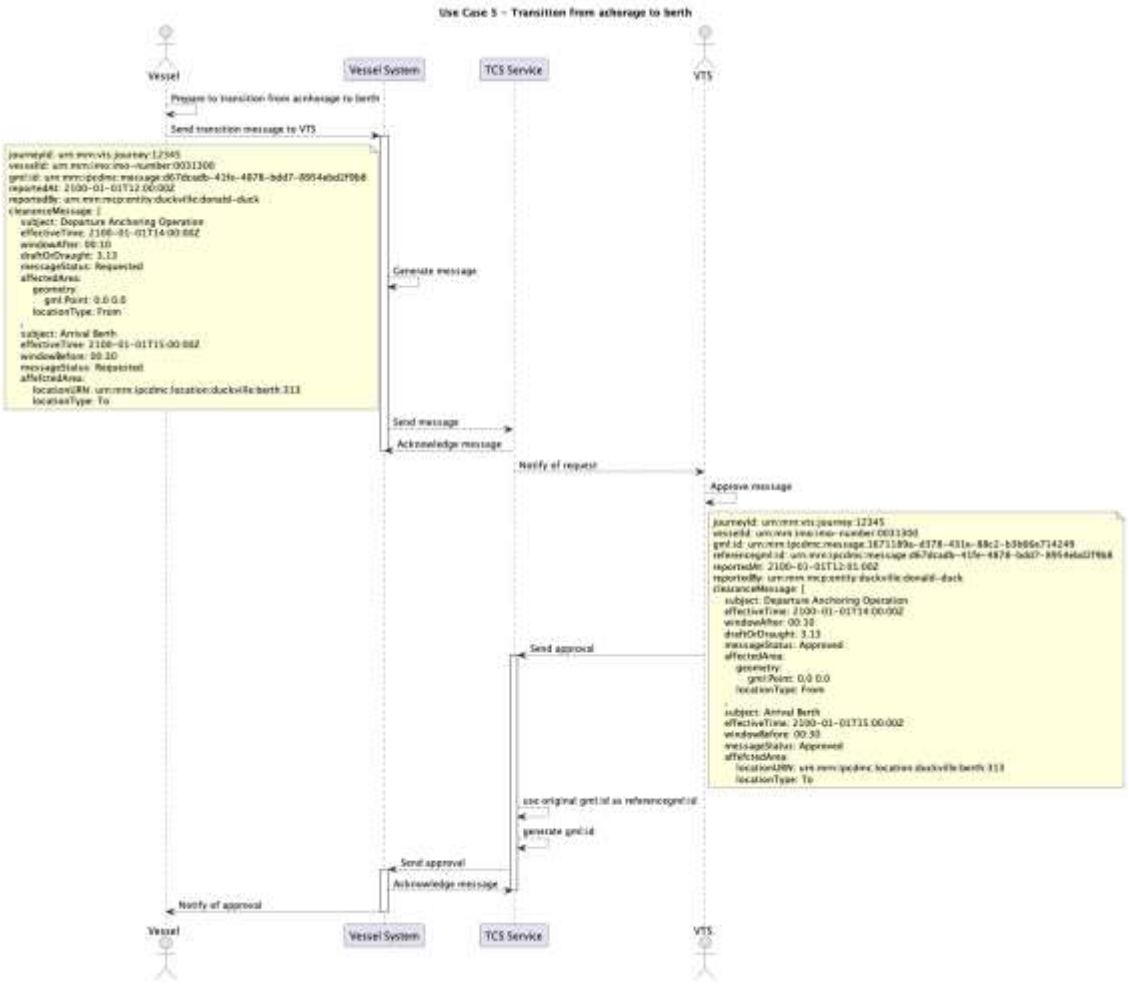

Figure 9 Use Case 5 sequence diagram

Note that the following use case may be initiated by either the ship or VTS. The following diagram focuses on illustrating the message structures in this use case.

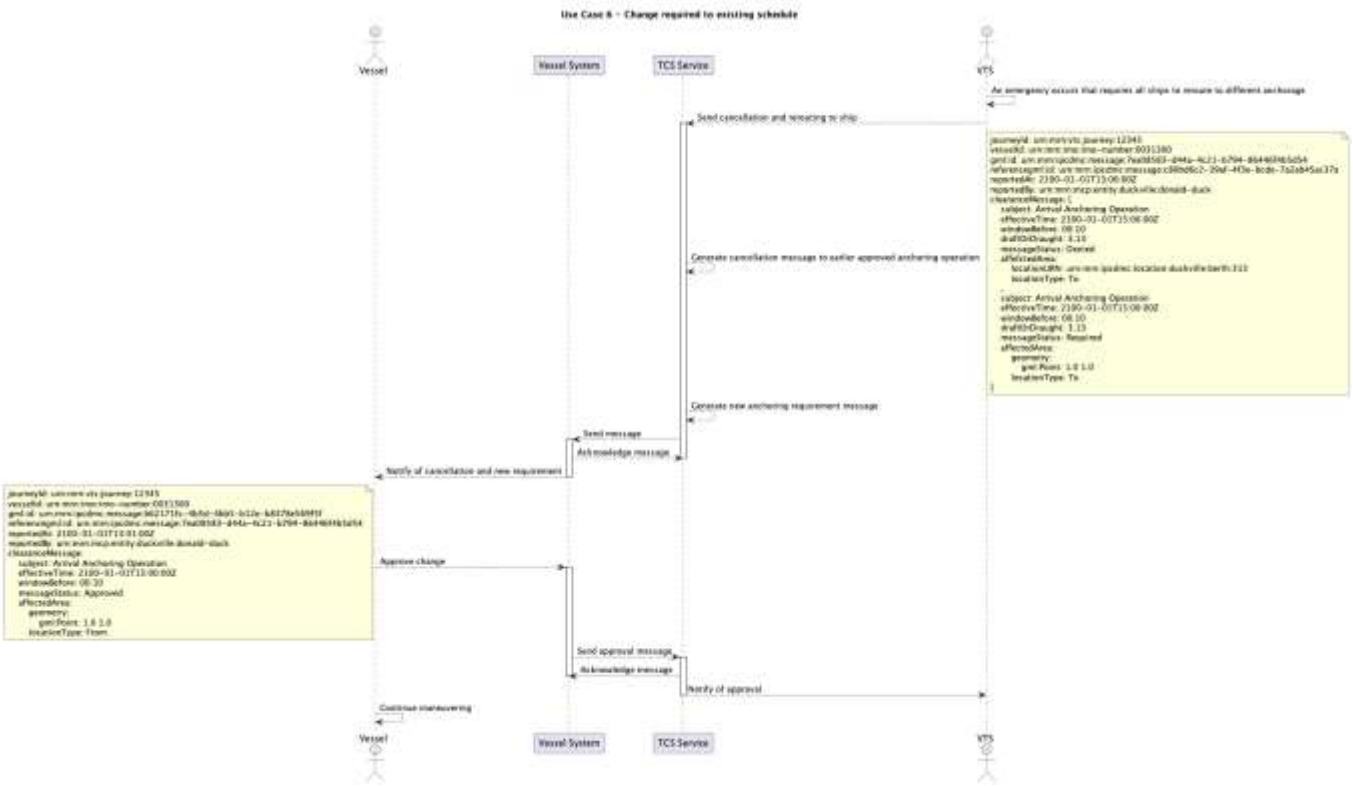

Figure 10 Use Case 6 sequence diagram

7 References

Nr.		Reference
[1] IALA Guideline G1128		THE SPECIFICATION OF E-NAVIGATION TECHNICAL SERVICES
[2] IMO FAL.5 /Circ.52		Guidelines for Harmonized Communication and Electronic Exchange of Operational Data for Port Calls
[3] IALA Recommendation R1023		MARITIME RESOURCE NAMES
[4] IHO Standard S-100		IHO Universal Hydrographic Data Model https://iho.int/uploads/user/pubs/standards/s-100/S-100_5.0.0_Final_Clean_Web.pdf
[5] IALA data model S-212		IALA VTS Digital Information Service Product Specification

8 Acronyms and Terminology

8.1 Acronyms

Term	Definition
API	Application Programming Interface
MRN	Maritime Resource Name
RTA/RTD	Requested time of arrival/departure
URI	Uniform Resource Identifier
UUID	Universally Unique Identifier v4
XML	Extendible Mark-up Language
XSD	XML Schema Definition

8.2 Terminology

Term	Definition
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 centres, 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 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-212 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 centres, organizations (e.g., meteorological), commercial service providers, etc.