

**IALA S-211**

**Product Specification**

**Draft 1.0.0 – March 2019**

IALA Port Call Message Product Specification

**Document Revisions**

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

|  |  |  |
| --- | --- | --- |
| **Date** | **Page / Section Revised** | **Requirement for Revision** |
| 31 January 2018 | Various | Conversion from STM Port Call Message Standard to IALA S-2xx specification |
| 03 October 2018 | Various | First review of S-211 Standard through IALA VTS Committee 45 |
| 07 December 2018 | Various | Including changes requested by IPCOTF and other stakeholders to create combatibility with other standards |
| 22 December 2018 | Various | Finalize S-211 for IALA submission Version 1.0.0 |
| 28 March 2019 | various | More finalization for Version 1.0.0; included changes for IALA comments; updates for S-100 4.0.0; updated data format schema diagrams. |
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# Overview

## Introduction

Ship-to-port, port-to-ship, port-to-port, as well as port actor-to-port actor communication needs to be standardized and precise in order to contribute to efficient coordination of port calls. This standard has been developed based on multiple instances of Port Collaborative Decision Making (PortCDM), as a sub concept of Sea Traffic Management (STM) validated within the STM validation project, in different ports, and on joint efforts with contemporary developments (such as the emerging time stamp standard (UKHO\_IHMA 2017), route exchange format, Electronic Product Code Information Services (EPCIS) empowered by Global Standards One (GS1), and standards adopted by port community systems and National Single Windows) using time stamp standards. The port call message standard builds upon taking the business logic, i.e. the understanding of how to conceive a port call, as its point of departure, in order to derive time stamps relevant to the exchanged information.

To be noted is that there is no intrinsic interest to develop a new standard if message standards that cater for the same needs already exist. Since the port call message standard crosses the boundaries of the e-navigation practice and the port operations practice as well as creating a link to hinterland and logistics operations it is most likely that this standard will inform the development of message types in multiple standards. The development of the Port Call Message Format has been informed by empirical needs provided from the implementation of PortCDM in 13 ports in Europe. The development of the standards has been driven from that it:

* is founded in a sequence of events constituting a port visit
* puts emphasis on the co-ordination logic for coming to agreements of, and realising service operations
* enhance the data granularity of which movements that are performed by vessels and other working vessels (such as tugs and pilots/pilot boats) to and from different locations
* enhance the data granularity of which operation that are performed at, or to/from, a particular location
* balance the granularity to distinguish each actor’s responsibility and course enough to not put excessive administrative burden on them.
* gives structure for the analysis of PortCDM Key Performance Indicators (KPIs) such as duration time, predictability, waiting times, punctuality, berth productivity, and capacity utilization
* is flexible enough to include/represent specific particularities of port calls from different ports
* gives structure for data analytics of historical data for the purpose of the identification of future patterns of behaviour

for the purpose of:

* increasing situational awareness for all effected actors
* being the foundation for a common understanding, across actors, on what and when services and events are expected to occur before, during and after a port visit of a ship
* increasing collaboration among effected actors
* providing basis for forecasting reliability of critical states and on-time probability of operations
* improving the input to the planning process, for all involved actors
* allowing effected actors more data to better plan activities in a coordinated manor
* enhancing inter-operability throughout the sea voyage berth-to-berth for enhanced efficiency, safety, and environmental sustainability throughout the sea transport
* helping identify areas of inefficiencies and bottlenecks in conjunction with the port visit
* supporting real-time decision making for responsible organizations and personal

The port call message standard

* is compliant with the international standard format for route exchange
* is compliant with the IMO e-Navigation concept and in specific the CMDS (Common Maritime Data Structure)
* will be included in the IHO GI Registry as the centre point of CMDS
* supports the relevant Maritime Service Portfolios (MSP) as defined in the IMO SIP and as described by documents under construction by IALA
* has a granularity, that matches general needs in logistics (could be transferred to hinterland transportation to further improve the maritime transport chain)

The Port Call Message standard originates from the MONALISA 2.0 and the STM validation projects and is maintained by the International PortCDM council. It was converted to an S-200 style product specification in January 2018.

# References

## Normative references

IHO S-100 IHO Universal Hydrographic Data Model, Edition 4.0.0, December 2018.

ISO 8601:2004 Data elements and interchange formats \_ Information interchange \_ Representation of dates and times

ISO/TS 19103:2005 Geographic information - Conceptual schema language

ISO 19111:2003 Geographic information - Spatial referencing by coordinates

ISO 19115:2006 Geographic information – Metadata (Tech Corr. 1, 2006)

ISO 19131:2007 Geographic information - Data product specifications

ISO/IEC 19505-1:2012, Information technology — Open Distributed Processing - Unified Modelling Language Version 2.4.1

## Informative references

ISO, 2006. ISO 19109 Geographic Information - Rules for Application Schema.

ISO, 2007. ISO 19135 Geographic Information – Procedures for Item Registration.

ISO, 2009. ISO 19136 Geographic Information - Geography Markup Language (GML).

IMO, 2008. Safety of Navigation Circular SN/Circ.243

IALA, 2017. Guideline 1106: Introduction to Preparing an IALA S-200 Product Specification

UKHO\_IHMA, 2017. Standards for nautical port information, version 5.2, August 2017

# Terms, definitions and abbreviations

## Terms and definitions

Terms and definitions have been taken from the normative references cited in clause 1.1.

The S-100 framework is based on the ISO 19100 series of geographic standards. The terms and definitions provided here are used to standardize the nomenclature found within that framework, whenever possible. They are taken from the references cited in clause 2.1. Modifications have been made when necessary.

**application schema**

**conceptual schema** for data required by one or more **applications** (ISO 19101)

**conceptual model**

modelthat defines concepts of a **universe of discourse** (ISO 19101)

**conceptual schema**

formal description of a **conceptual model** (ISO 19101)

**data product**

**dataset** or **dataset series** that conforms to a **data product specification**

**data product specification**

detailed description of a **dataset** or **dataset series** together with additional information that will enable it to be created, supplied to and used by another party

*NOTE: A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a dataset. It may be used for production, sales, end-use or other purpose.*

**dataset**

identifiable collection of data (ISO 19115)

*NOTE: A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature or feature attribute contained within a larger dataset. A hardcopy map or chart may be considered a dataset.*

**domain**

well-defined set (ISO/TS 19103)

*NOTE: Well-defined means that the definition is both necessary and sufficient, as everything that satisfies the definition is in the set and everything that does not satisfy the definition is necessarily outside the set.*

**feature**

abstraction of real world phenomena (ISO 19101)

*NOTE: A feature may occur as a type or an instance. Feature type or feature instance shall be used when only one is meant.*

**feature attribute**

characteristic of a **feature** (ISO 19101)

*NOTE 1: A feature attribute may occur as a type or an instance. Feature attribute type or feature attribute instance is used when only one is meant.*

*NOTE 2: A feature attribute type has a name, a data type and a domain associated to it. A feature attribute for a feature instance has an attribute value taken from the domain.*

**geographic data**

data with implicit or explicit reference to a location relative to the Earth (ISO 19109)

*NOTE: Geographic information is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.*

**metadata**

data about data (ISO 19115)

**model**

abstraction of some aspects of reality (ISO 19109)

**portrayal**

presentation of information to humans (ISO 19117)

**quality**

totality of characteristics of a product that bear on its ability to satisfy stated and implied needs (ISO 19101)

**universe of discourse**

view of the real or hypothetical world that includes everything of interest (ISO 19101)

## Abbreviations

CRS Coordinate Reference System

DCEG Data Classification and Encoding Guide

ECDIS Electronic Chart Display and Information System

EPCIS Electronic Product Code Information Services

EPSG European Petroleum Survey Group

ENC Electronic Navigational Chart

FTA Finnish Transport Administration

GML Geography Markup Language

GS1 Global Standards One

IALA International Association of Marine Aids to Navigation and Lighthouse Authorities

IHO International Hydrographic Organization

IMO International Maritime Organization

ISO International Organization for Standardization

KPI Key Performance Indicator

PCM Port Call Message

REST Representational State Transfer

STM Sea Traffic Management

UML Unified Modeling Language

URI Uniform Resource Identifier

XML Extensible Markup Language

XSLT eXtensible Stylesheet Language Transformations

# Product specification metadata

|  |  |
| --- | --- |
| **Title** | Port Call Message Product Specification |
| **S-211 Version** | 1.0.0 |
| **S-100 version** | 4.0.0 |
| **Date** | 28 March 2019 |
| **Language** | English |
| **Identifier** | S-211 |
| **Classification:** | **001 - unclassified** |
| **Contact:** | IALA-AISM 10, rue des Gaudines 78100 Saint Germain en Laye, France Telephone: +33 1 34 51 70 01 Fax: +33 1 34 51 82 05 |
| **URL:** | iala-aism.org |
| **Maintenance:** | The product specification is maintained by the International PortCDM Council (IPCDMC) and amendments are performed on a needs base, up to maximum one new release per calendar year. |

## IALA Product Specification Maintenance

This chapter is for clarification only on PS Maintenance.

### Introduction

Changes to a product specification will be released by IALA-AISM as a new edition, revision, or clarification.

### New Edition

New editionsof a product specification introduce significant changes. *New editions* enable new concepts, such as the ability to support new functions or applications, or the introduction of new constructs or data types.

### Revisions

*Revisions* are defined as substantive semantic changes to a product specification. Typically, revisions will change a product specification to correct factual errors; introduce necessary changes that have become evident as a result of practical experience or changing circumstances. A *revision* must not be classified as a clarification. *Revisions* could have an impact on either existing users or future users of a product specification. All cumulative *clarifications* must be included with the release of approved corrections.

Changes in a revision are minor and ensure backward compatibility with the previous versions within the same edition. Newer revisions, for example, introduce new features and attributes. Within the same edition, a data product of one version could always be processed with a later version of the feature and portrayal catalogues.

### Clarification

Clarifications are non-substantive changes to a product specification. Typically, clarifications: remove ambiguity; correct grammatical and spelling errors; amend or update cross references; insert improved graphics, spelling, punctuation and grammar. A clarification must not cause any substantive semantic change to a product specification.

Changes in a clarification are minor and ensure backward compatibility with the previous versions within the same edition. Within the same edition, a data product of one clarification version could always be processed with a later version of the feature and portrayal catalogues, and a portrayal catalogue can always rely on earlier versions of the feature catalogues.

### Version Numbers

The associated version control numbering to identify changes (n) to a product specification must be as follows:

New editions denoted as **n**.0.0

Revisions denoted as n.**n**.0

Clarifications denoted as n.n.**n**

# Specification Scope

This product specification describes one data product and therefore requires only one scope which is described below:

**Scope ID:** Port Call Message datasets.

**Hierarchical level:** MD\_ScopeCode - 005

**Hierarchical level name:** dataset.

**Level description:** information applies to the dataset

**Extent:** EX\_Extent.description: Global coverage of maritime areas

# Data Product Identification

## Dataset Identification

|  |  |
| --- | --- |
| **title** | Port Call Message |
| **abstract** | A Port Call Message is a vector dataset containing all relevant information in a communication of port call information between ship and port, ship to ship, VTS or other shore authorities. |
| **content** | Port Call information, such as status and location information with associated timestamps. |
| **geographicDescription** | EX\_GeographicDescription: Examples: country; official name of region if any |
| **spatialResolution** | MD\_Resolution>levelOfDetail (CharacterString): “All scales” |
| **purpose** | Port Call Message datasets are produced to allow the producer to exchange port call information between ship and port, ship to ship, VTS or other relevant and authorized authorities. |
| **language** | EN |
| Additional values use CharacterString (ISO 639-2) |

# Data Content and structure

## Introduction

A PCM dataset is a feature-based product that corresponds to a communication of information relating to a port call by a ship. The following sub-sections contain the product application schema expressed in UML and an associated feature catalogue. The feature catalogue provides a full description of each feature type including its attributes and attribute values in the data product.

## The concept of the Port Call process

A port call process is conceived as divided into three process steps; Arrival, Port Visit, and Departure. It also includes two contextual process steps; pre-arrival and post-departure. The Port Visit reflects the purpose of call. The VTS, where applicable, in order to better fulfill their tasks, are involved in various steps throughout this process. Specifically in the pre-arrival and post departure processes, but often also during the other process steps, e.g. during repositioning the ship within a port or while maneuvering during arrival or towards departure Each process step is to be conceived as existing of different sub processes and each sub process covers a number of events (see Figure 7‑1 below). Dependent of the purpose of call there will be different combinations of sub processes and events. This hierarchical structure provides a capability to position a state as part of an event, an event as part of a sub process, and a sub process as part of a process step, providing basis for deriving situational awareness for enhanced co-ordination. Sub processes and events could be conducted sequentially and in parallel. During a port call there will always be an arrival and departure process step and most likely a port visit. Combination of sub processes and events are dependent of the purpose of call.



Figure 7‑1. The concept of a port call process

A port call is thus a process composed of process steps for arrival, port visit, and departure putting the operations associated with the turn-around process of the vessel at the core. The arrival process consists of port arrival sub process. The port visit is composed by series of port manoeuvring, berth visit, and anchoring sub processes. As indicated in Figure 7‑1 the port visit can be constituted by multiple port manoeuvring, berth visit, and anchoring events. In this way berth shifting can be captured. The departure process step captures the port departure as a sub process. From a port perspective, the arrival step is preceded by pre-arrival capturing sub processes related to actions related to the vessel’s journey stretching back to the departure from previous port, and the departure step is succeeded by actions related to the vessel’s journey stretching to the arrival to the next port. VTS activities, where applicable, are integral aspects of these activities. As such VTS need to be included in the data exchange using S-211 data streams to enable close collaboration through increased situational awareness within the VTS.

In Figure 7‑2, a metro map is used as the metaphor for illustrating the complexity, and the need for collaboration between multiple actors, in staging a port call. The metro map expresses a positioned state catalogue in relation to the port call process and its actors on a generic level. The metro map is also a source for inspiration for different dashboards being used, adapted to each actor’s needs, for providing situational awareness enabling informed decisions on collaborative foundations to be made by each actor. In Figure 7‑2, each metro line represents an actor and each metro station represents a state — such as a location state, service state, or administration state — that is of importance for the coordination of the port call process. The metaphor illustrates a flow of states having a coordinating function in a port call, from the arrival of a vessel (left part of Figure 7‑2) to its departure (right part of Figure 7‑2). By including states related departure previous port and arrival next port the port visit at the focused port can be associated to a chain of port visits and thus enabling port-to-port collaboration.

As depicted in Figure 7‑2, there are several states that indicate a high degree of coordination and synchronized performances from several actors. The states that require two or more actors to be synchronized in time and/or space are referred to as coordination points. States prior to coordination points are as important for an optimal realization of a port calls but are more actor specific in their nature and are defined as actor specific milestones.

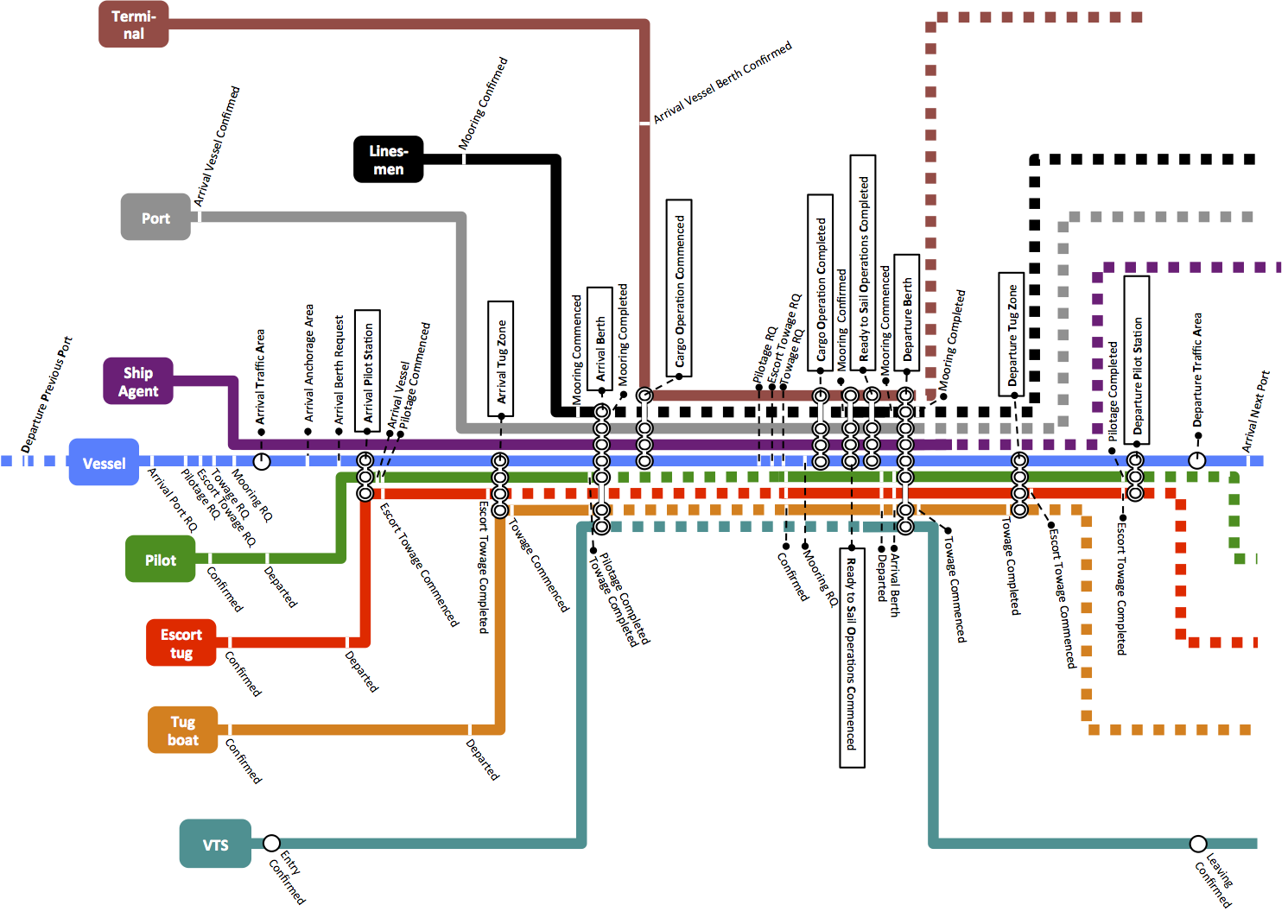


Figure 7‑2. States and coordination points in the port call process - a generic state chart used for port specific adaptation of the PortCDM concept*[[1]](#footnote-1)*

The composition of states related to a particular event represent stages of progress for an event, as e.g. the result of the event towage\_requested is an indication of the progress of the event towage.

### Concept of port call message

A PortCall message encapsulates the data related to one Vessel’s visit to one Port as part of one inbound voyage and one (optional) outbound voyage dependent on if the voyage is concluded in the port call. This means that a voyage could refer any number of port calls, i.e. two or more dependent if the same voyage includes one or several port calls, and a port call could refer to one or two voyages. At the Destination PortCall of a Voyage, this Voyage is the inbound Voyage of the PortCall. This PortCall will become the departing PortCall of a new outbound Voyage.

The Vessel, Port and Voyage entities are assumed to be part of, the overall shoip voyage. As such there is a correlation between the S-211 standard defined in here, with the focus of the port call, and the ships sea going voyage, which is being communicated using the S-421 (Voyage Information Standard) standard developed and maintained by IEC. The Port Call entity might also be part of the voyage information domain, but shall at least have a unique voyage identifier—port call messages, carrying data about a port call must provide the port call identifier as means of identifying the port call for which the data applies. It is further assumed that the related data domains, like, but not limited to, S-421, keeps a registry of all valid locations, including ports, and the relevant locations within a port (e.g. rendezvous point, anchoring areas, and quays).

### The constituents of time stamps

To a particular state there are different communicative functions that are associated. The time of when a particular state should be reached could be **recommended** to someone(s) for its occurrence (as e.g. a recommendation of when the vessel should initiate the port visit). The time of when a particular state could be **planned** of when it is aimed to occur as well as **estimated** of when it is expected to be occur. When a state has occurred its status becomes **actual.** A state can also be **required** by someone.

These different time types, i.e. *recommended*, *planned*, *estimated*, *actual,* and *required* are different possible time types that could enable enhanced coordination among involved actors. Associated states to an event represents the progress of the event, is initiated by the progress of other states (within the same or in other events), and could trigger other states (within the same or in other events).

A state could concern the certain time a physical object has arrived at, or departed from a particular geographical spot (**location state**), such as the vessel is at berth (all fast), and the certain time a particular service is to be commenced or completed (**service state**), such as cargo operations are commenced. Commencing and completing a service is normally preceded by sequences of communicative acts such as requested, request received, denied, confirmed, and cancelled regulated in the time sequence of the state (see section 7.2.5 below - **administration state**). A time stamp of an administration state is not combined with a time type since all administration states are actuals.

A unique combination of time type and state type constitute the time stamp (Figure 7‑3), as e.g. *Estimated Time of Arrival Vessel at Pilot Boarding Area* which is the specification of what is often referred to as ETA. This suggested level of granularity specifies what it concerns (reference object, see section 7.2.3 on location states) and to which location, decreasing the probability for misunderstanding.

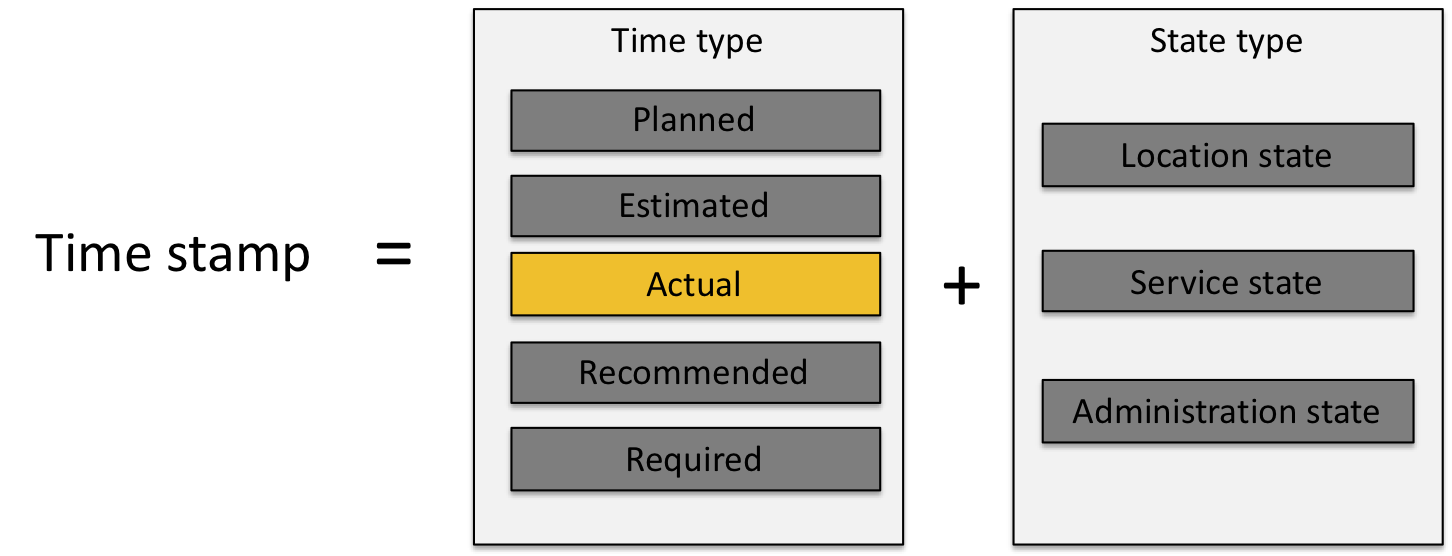


Figure 7‑3. The constituents of a time stamp

A full list of, so far, identified states (including abbreviations and synonyms) associated to a port call is captured in section 15, based on the objects and locations identified in sections 7.2.3 & 7.2.4. This list of location and service states are to be seen as generic. In future versions of the port call message standard different types of states associated with different types of port calls, such as cruises, container traffic, wet and dry bulk, ferries etc. will be pinpointed.

### Location states

A location state captures the location (such as traffic area, berth, tug zone, pilot boarding area, etc.), which a reference object (such as vessel, pilot, tug, etc.) arrive to or depart from (Figure 7‑4). As for example, based on the nomenclature for a location state an arrival for a vessel to traffic area is expressed as *Arrival\_Vessel\_Traffic\_Area*. A location state is thus defined by a unique combination of time sequence, reference object, and from\_location/to\_location.

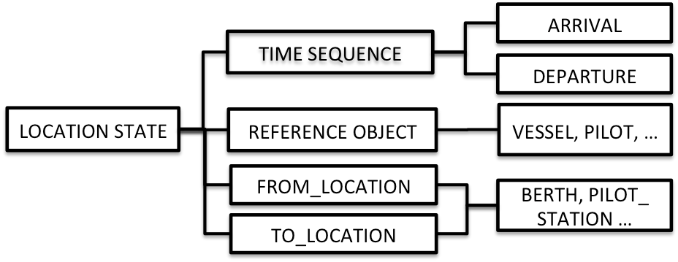


Figure 7‑4. The constituents of a location state

In other words, a reference object is the object that changes location. The following reference objects have been identified so far (extensible list for future versions of the port call message standard):

|  |  |  |
| --- | --- | --- |
| * Agent | * Bunker Vessel | * Escort tug |
| * Fresh water vessel | * Gangway | * Ice Breaker |
| * Moorer | * Passenger | * Pilot |
| * Pilot Boat | * Pontoons & Fenders | * Security |
| * Slop vessel | * Sludge vessel | * Surveyor |
| * Tug | * Vessel |  |

Table 7‑1. Reference objects

For an arrival state the to\_location is mandatory and the from\_location is optional and for a departure state the from\_location is mandatory and the to\_location is optional. Table 7-2 gives locations have been identified so far (extensible list for future versions of the port call message standard). Each location shall be identified by a URN code following the MRN identifier, and optionally a latitude and longitude can be given.

|  |  |  |
| --- | --- | --- |
| * Anchoring Area | * Berth | * Buoy |
| * Etug zone | * Home Base | * Loc |
| * Pilot Boarding Area | * Port | * Port Area |
| * Rendezvous Area | * Traffic Area | * Tug Zone |
| * Vessel | * VTS Area |  |

Table 7‑2. Locations

### Service states

A service state expresses services (such as towage, pilotage etc.) requested by someone and to be supplied to someone and whether when it is expected/recommended/planned/required to be or has been commenced or completed (c.f. Figure 7‑5). A service state is thus defined by a unique combination of service object and time sequence.

The location for where the service to be supplied is also specified. If the service implies a movement from one location to another, as in the case of pilotage and towage, it is specified from which location (“from location”) and to which location (“to location”) the service is conducted. In the case of that it is relevant to specify where the service is to be/are being performed (not involving any movement) as in the case of arrival mooring operations and departure mooring operations, the “at location” is specified where the service is realized. In order to derive solid port call structures out of several messages it is necessary to specify locations.



Figure 7‑5. The constituents of a service state

The following service objects have so far been identified (extensible list for future versions of the port call message standard):

|  |  |  |
| --- | --- | --- |
| * Anchoring | * Arrival Anchoring Operation | * Arrival Berth |
| * Arrival Port Area | * Arrival VTS Area | * Berth Shifting |
| * Berth Visit | * Bunkering Operation | * Cargo Operation |
| * Cargo Survey | * Departure Anchoring Operation | * Departure Berth |
| * Departure PortArea | * Departure VTS Area | * Embarking |
| * Escort Towage | * Forklift | * Gangway Operation |
| * Garbage Operation | * IceBreaking Operation | * Inspection |
| * Loading Operation | * LubeOil Operation | * Mooring Operation |
| * Pilot Boat Operation | * Pilotage | * Pontoons & Fenders Operation |
| * Port Visit | * Port Cargo Survey | * Pre Cargo Survey |
| * Provision Operation | * Ready to sail operation | * Security Operation |
| * Slop Operation | * Sludge Operation | * Tours |
| * Towage | * Unloading Operation | * UnMooring Operation |
| * Water Operation | * Crane Operation | * Ramp Operation |

Table 7‑3. Service objects

These different services are optional dependent on the purpose of the call, the charact­eristics of the cargo, and particular port characteristics. As e.g. pre/post cargo survey is not applicable for all types of cargo. The list of possible service objects is thus dependent of the characteristics of the port call such as, type of vessel, and port characteristics.

### Administration states

Services depend on agreements that are made between involved actors. Agreements between actors are patterns of interaction constructed of requests, reception of requests, denials and confirmations between actors, as for example, pilot requested and pilot confirmed (c.f. Figure 7‑6). The time sequence characteristics possible to express interactions associated to service states are; requested, request received, denied, confirmed, and cancelled. For administration states the time type is requested to be an actual time. An administration state is thus defined by a unique combination of service object and time sequence.

The location for where the service (from\_to or at) is specified in the same way as for service states.

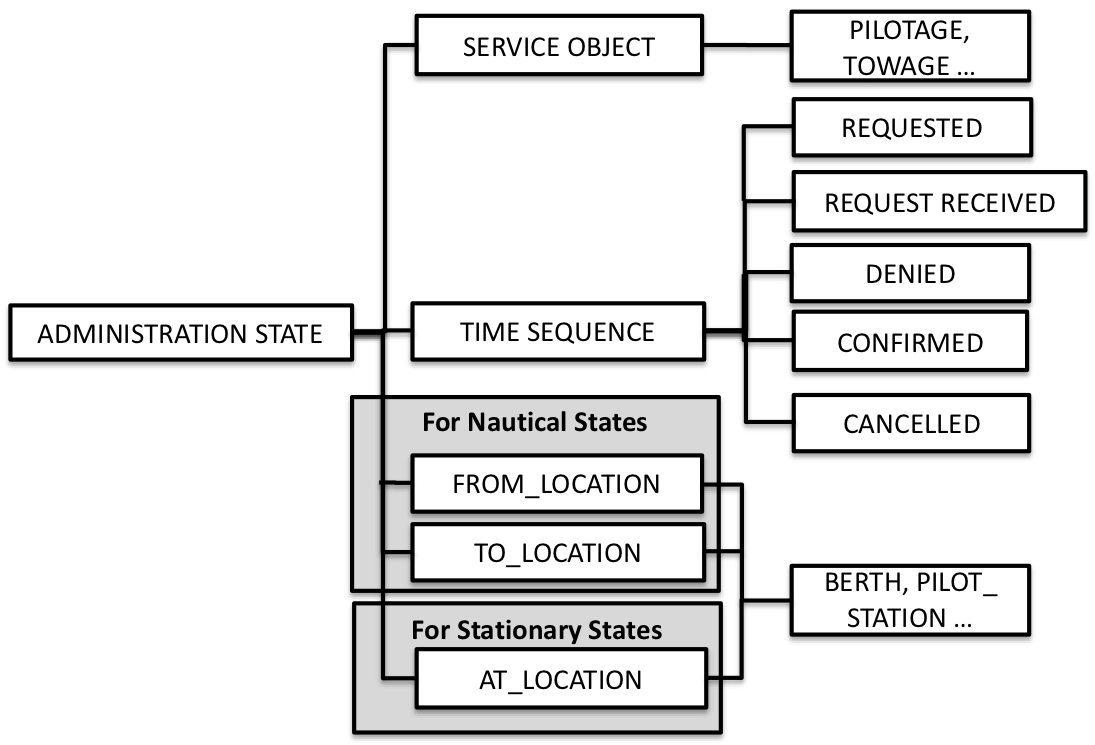


Figure 7‑6. The constituents of an administration state

### Different time types

As indicated in Figure 7‑3, four time types are covered in the port call message standard. The four basic time types are defined as follows:

* PT – Planned Time: The time **when** **a particular actor committed to** arrive at, or depart from, a certain location (location state) or initiate/complete a particular service (service state).
* RT – Recommended Time: The time **recommended to another actor to** arrive at/depart from a certain location (location state) or initiate/complete a particular service (service state). Recommended times is used as a basis for changing planned times.
* ET - Estimated Time: The time for **when** **a particular actor estimates to** (possibly based on calculations) arrive at, or depart from, a certain location (location state) or initiate/complete a particular service (service state). An estimated time is often made based on assumptions on forecasted circumstances (such as weather forecasts) and insights on other actors’ estimations.
* AT – Actual Time: The time **when an actor** arrived at/departed from a certain location (location state) or initiated/completed a particular service (service state). The actual time is used for evaluation based on the actual occurrence related to planned and/or estimated times. Actual times can also be used for billing, logbooks and/or statements of facts.
* QT – Required Time: The time for **when an actor** is required, contractually or binding in some other way, to arrive to or depart from a specified location. Required time can also be used to communicate, in a similarily binding way, when a Service should be commenced or completed.

### Relationship between timestamps

Associated to a port call there are multiple messages that concerns different states. The constitution of the port call message standard allows six types of relationships on state level:

1. Action pairs of time sequences of location states, which means that a departure ***is always*** preceded by an arrival (or an arrival is always succeeded by a departure)
2. Action pairs of time sequences of service states, which means that the completion of a service ***is always*** preceded by commencing it (or commencing a service is always succeeded by completing it)

These action pairs provides a structure to the larger port call structure of the port visit (see Figure 7‑7 below).



Figure 7‑7. Action pairs of time sequences of location and service states providing structure to the port visit

1. Administration states as coordinating states for service states, which means that the agreement process of commencing and completing a service is stressed by associating relevant communicative states (requested, request received, confirmed, denied, and cancelled) is related to when the service is to be commenced and completed.
2. Events as groups of states, which means that each event would be captured by a number of different states, such as e.g. that the arrival berth event would group both service states related to the berth visit (commenced, requested, request received, confirmed, denied, and cancelled) as well as arrival berth to each other.
3. Relationships between states as the integrator between different events, which means that the berth visit event would be related to the mooring event
4. Groups of events, which means that events that are associated to each other are grouped together, as e.g. berth visit event and cargo operations events

Further, the time type dimension also allows for that action pairs of different time types can be formed, i.e. estimates/planned/recommended/required time type of a commencing or completing a service or arriving or departing from a location grouped with an actual time type.

### Summary – the constituents of the port call process

To summarize, the port call process is a complex sequence of activities, some optional and some mandatory, and some sets of sequences possibly repeated. However, the more information about states, the better possibility to coordinate for the purpose of optimization and synchronization. Thus, it needs to be captured on different levels of granularity to provide complete operational support. A layered model has therefore informed the composition of a port call message standard. The basic unit of analysis is the time stamp. A combination of states characterizes an event and a sub-process is compound of one or several events. In Figure 7‑8, these layers (including instances) are captured.



Figure 7‑8. Layered model constituting the port call process

To be noted is that there might be several different events (service objects) applicable for different purposes of the call. Examples of such events would be bunkering, repairs, waste/garbage disposal, supplies/provision, sloop operations, sludge operations, water supply, as well as formalities (customs, immigration, health inspections etc.). All of these are not yet covered, i.e. there is room for extension of the standard by adding new service objects based on the need of enhanced coordination of the port call.

Note that new terms might just be added by a new feature catalogue, and no need for software changes provided new functions aren’t needed. Implementers should factor in the use of the feature catalogue as a means to update the data model and not hard code it.

The port call message standard allows for bringing in new service object adapted to different purposes of calls and to different port needs. Such service objects would then follow patterns of requested-request received-denied-confirmed-cancelled expressed by associated administration states.

The port call message standard is built upon three state types, where two of those (location states and service states) are possible to combine with a time type (see Figure 7‑9). Each state type comes with a time sequence and should be expressing at which location to or between which locations the service or movement refers.

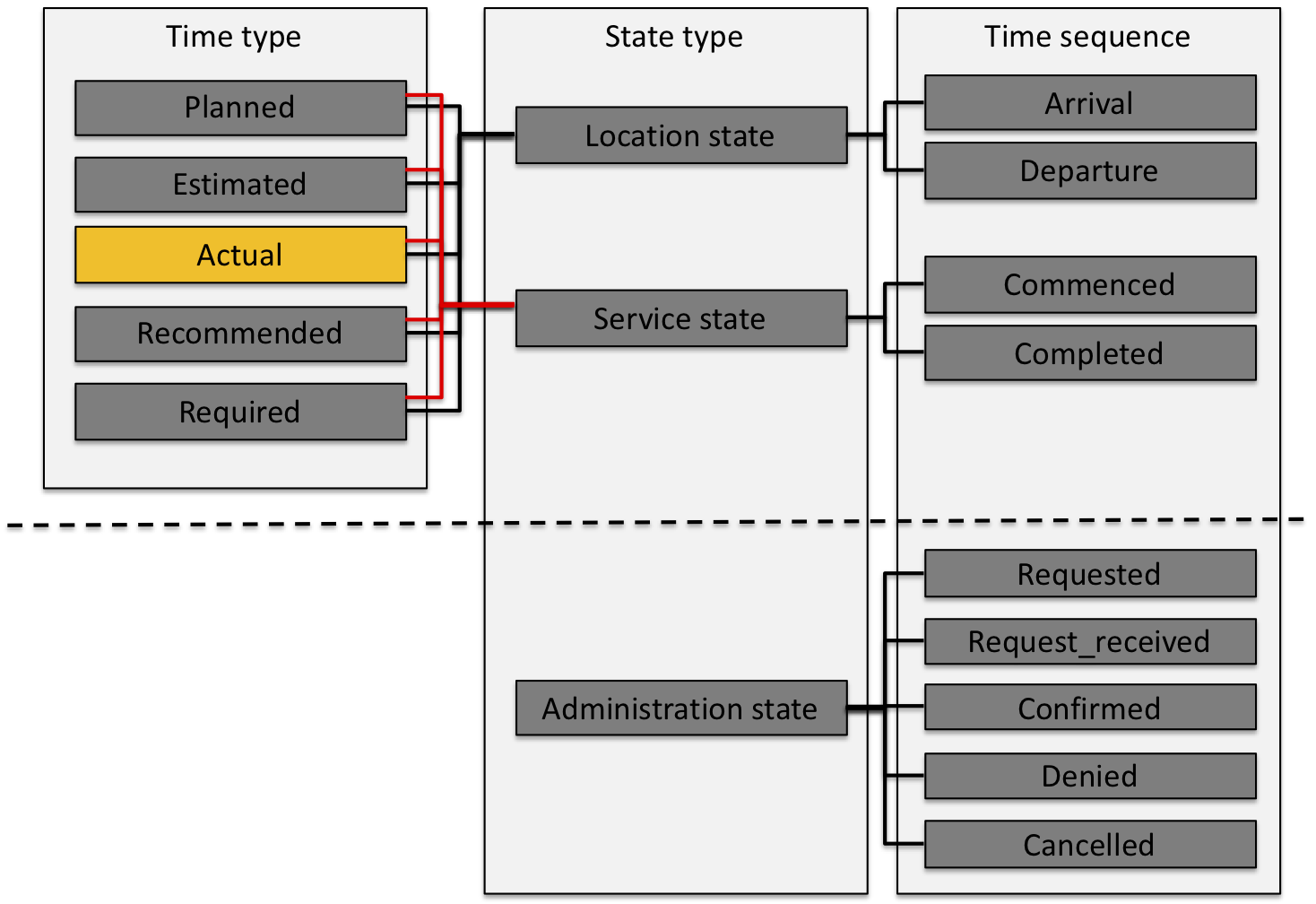


Figure 7‑9. Overview of time stamp composition and its relation to time sequences for different time types

Port call data are encapsulated in a number of abstractions. The top-level abstraction is the **ProcessStep**, which represents overarching port call phases (referred to as process steps in Figure 7‑8 above) currently envisioned to be: Pre-Arrival, Arrival, Port visit, Departure, and Post-departure. A ProcessStep is further subdivided into **SubProcess** entities, where a SubProcess represents a set of related events. An example of a SubProcess instance is port manoeuvring, i.e. taking the vessel from an anchoring zone to berth, or between quays. A SubProcess entity is subdivided into **Event** instances, where an Event represents a small and coherent unit of work. Examples of typical events are pilotage, towage, cargo operations, arrival berth, departure berth, arrival port area, and departure port area. An Event, in turn, comprises **State** instances. A State represents a progress (or state) of a specific operation. The progress of an operation is chosen carefully such that it carries important properties for synchronizing and evaluating overall port call progress, and for planning future operations. Typical examples of State instances are: arrival vessel to traffic area (Arrival\_Vessel\_TrafficArea) (i.e. to the port area), cargo operations completed (CargoOp\_Completed), and towage commenced (Towage\_Commenced).

### Constraints on states in port call messages

In addition to the information model described above, the **StateDefinition** concept constrains valid PortCDM states. While combining elements of the Port Call Message format may produce any number of possible States, only a subset of these is considered valid within PortCDM (an initial set is shown in the port call metro map metaphor). It is envisioned that a standardized **State Catalogue** defines the set of valid PortCDM states in terms of StateDefinition templates. A StateDefinition shall comprise at least an identifier, a name/description together with the Port Call Message (PCM) format elements that define it. Example StateDefinition instances may be defined as:

**ID**: *Arrival\_Vessel\_TrafficArea*

**Name**: *Vessel arrival to traffic area*

**PCM definition**: **Type**: *LocationState*,

**ReferenceObject**=*VESSEL*, **TimeSequence**=*ARRIVAL\_TO*, **Location**=*TRAFFICAREA*

**ID**: CargoOp\_Commenced

**Name**: *Cargo operations Commenced*

**PCM definition**: **Type**: *StationaryServiceState*,

**ServiceObject**=CARGO\_OPERATION, **TimeSequence**=*COMMENCED*

## Application Schema

The application schema conforms to the modelling conventions of UML as constrained in S-100 Part 1, and conforms to the General Feature Model described in Part 3.

**PortCallMessage** is the central object, and only feature class, in the port call information model. A PortCallMessage encapsulates the data related to one **Vessel**’s visit to one **Port** as part of one inbound voyageand one(optional) outbound voyage as described in section 7.2.1.

Following the nomenclature discussed in sections 7.2.3–7.2.5, concrete instances of a State are modeled as **locationState**, **serviceState** or **administrationState** complex attributes in the model.

A **locationState** represents a reference object’s arrival to, or departure from (controlled by the attribute **timeSequence**), a specific location.

A **serviceState** represents the progress of a service object (controlled by the attribute **timeSequence**), such as cargo operations commenced or towage completed. Performing actor is also captured for service states.

An **administrationState** represents interactions associated to service states.

The **timeSequence** attributes in the various “State” complex attributes are constrained to values that are meaningful in the context of the particular State.

Finally, a State may contain a stated time using the attribute **effectiveTime** and a specification of the meaning of that time, controlled by the attribute **timeType**. For instance, providing an estimated time for the State ‘arrival\_vessel\_trafficarea’ with the **timeType** ESTIMATED would mean an estimation of when the vessel will arrive to the port. In addition, it includes meta-data (which actor reported the data, and at which time) as well as a free text comment. There is also an extension point, vendorExtension, allowing implementors to add vendor specific data, related to the state.

The application schema is provided in Figure 7‑10. **PortCallMessage** binds attributes identifying the vessel, port call, and the message itself, as well as the source and time of the message. Data about the nature and status of the port call (“payload”) is carried by “State” complex attributes. Alternatively, the payload may consist of a **messageOperation** element which can be used to withdraw (cancel) an earlier message. A message can can contain only one of the “State” or **messageOperation** components.



Figure 7‑10. Application schema diagram

There are no spatial types used in this product specification.

### Meta features application schema

This data product does not make use of meta-features.

## Feature Catalogue

The Feature Catalogue describes the feature types, information types, attributes, attribute values, associations and roles that may be used in the product. It also assigns the geometric primitives. The S-211 Feature Catalogue is available in an XML document which conforms to the S-100 XML Feature Catalogue Schema and can be downloaded from the IALA website (iala-aism.org). A printed version of the feature catalogue is provided in Annex D.

**Name:** Port Call Message Feature Catalogue

**Scope:** Ports, Harbours and Inland waters

**Version Number:** 1.0.0

**Version Date:** 2019-03-28

**Producer:**

IALA-AISM

10, rue des Gaudines

78100 Saint Germain en Laye, France

Telephone: +33 1 34 51 70 01 Fax: +33 1 34 51 82 05

URL : https://iala-aism.org

**Language:** English

## Feature Types

Feature types contain descriptive attributes and do not contain any geometry (i.e. information about the shape and position of a real-world entity). Features have two aspects – feature type and feature instance. A feature type is a class and is defined in a Feature Catalogue. A feature instance is a single occurrence of the feature type and represented as an object in a dataset. A feature instance is located by a relationship to one or more spatial instances. A feature instance may exist without referencing a spatial instance.

S-211 only makes use of the Geographic (Geo) feature type. This type carries the descriptive characteristics of a real-world entity.

Information types are not used in this specification.

## Data Product Types

A PCM dataset contains only one feature, along with its attributes and metadata which comprises aspecific communication of port call information. A PCM dataset consists of only a single port call message. Though the service broker may provide collections of zero or more messages in response to a request, such a collection is not considered a dataset for the purposes of this specification.

### Dataset rules

Since port call messages do not use extent information and there is no discovery metadata for a message (“dataset”), Data Coverage features are not used – in fact there are no meta-features implemented.

PCM messages are updated by new messages that must be considered a whole replacement of the previous version. Delta change messages are not permitted.

PCM messages are cancelled (“withdrawn”) by sending a new **PortCallMessage** with the value of attribute **messageOperation->categoryOfMessageOperation** corresponding to the WITHDRAW value of the **categoryOfMessageOperation** enumeration.

Single PCM messages must not exceed 10kB. PCM collections must not exceed 20MB.

# Co-ordinate Reference Systems (CRS)

There is no coordinate information in this product specification and therefore CRS is not relevant.

# Data Quality

## Introduction

Data Quality is considered to be meta information and for S-211 it is divided into two parts:

* Compliance and integrity
* Uncertainty and lineage

## Data Compliance and Integrity

S-211 datasets must be validated using the conformance checks that are listed in Annex F. The data quality elements listed in S-100 Part 4C that are applicable to S-211 are indicated in the table of conformance checks listed in Annex F.

Datasets must not be communicated unless they pass all the compliance checks designated as “Critical”.

The detailed results of applying compliance checks listed in Annex F are not required to be reported as part of the exchange set.

## Uncertainty and lineage information

### Positional accuracy

All S-211 positions are approximate and there is no foreseen value to the intended users in estimating the accuracy of positions in S-211. Therefore, data quality indicators are not defined nor is the model of data quality elements defined in S-100 Part 4c implemented in this specification.

This specification does not prescribe a specific required level of positional accuracy.

### Lineage

Lineage and process step information elements are not required to be present in S-211 datasets distributed to end user.

Required source information about S-211 datasets is limited to the source and distribution information contained in discovery metadata described in S-100 Part 4a and Section 12 of this product specification.

# Data Capture and Classification

The Data Capture and Classification (DCEG) is found in Annex A.

# Data Maintenance

## Introduction

PCM datasets (messages) are not replaced as such, but may be superseded or cancelled by new datasets (messages) that follow earlier messages. Delta change datasets are not permitted. Edition numbers are not used.

The time attribute of the state for a specified port call (determined by port call ID, which is unique to a port call by a vessel) determines supersession or cancellation of earlier messages.

## Maintenance and Update Frequency

Messages are updated by subsequent messages, as and when needed. No maintenance is needed for PCM datasets since PCM operates on the assumption that ‘updates’ consist of an entire new PCM.

# Data Product format (encoding)

## Introduction

Detailed documentation of the S-211 encoding schema is provided in Annex B of this document.

Format Name: XML, Specification: custom.

**File Structure: S-211 (IALA PCM Product Specification), Annex B.**

## Numeric Attribute Encoding

Floating point and integer attribute values must not contain leading zeros. Floating point attribute values must not contain non-significant trailing zeros.

## Text Attribute Values

Character strings must be encoded using the character set defined in ISO 10646-1, in Unicode Transformation Format-8 (UTF-8).

## Mandatory Attribute Values

Some attribute values are considered mandatory for the following reasons:

* Certain messages make no logical sense without specific attributes,
* Some attributes are necessary to determine which symbol is to be displayed,

All mandatory attributes are identified in the Feature Catalogue and summarised in Annex A – Data Classification and Encoding Guide.

## Unknown Attribute Values

It is an error for a mandatory attribute value to be missing. Mandatory attributes cannot be “nilled”.

Optional attributes must be omitted altogether if the value is unknown or missing.

## Structure of dataset files

A ‘dataset’ in this product is a message that consists of a single object encoded as an XML element PortCallMessage.

Collections of objects may be wrapped as determined by the REST API, e.g. in a <collection> XML element. This wrapping is out of the scope of this product specification.

## Message object identifiers

Each message object is identified by a **messageId** based on UUID in URN format, in accordance with RFC 4122 . This allows us to assign message identifiers in a distributed manner with no centralised id management and still be guaranteed that all message identifiers are globally unique. As a result, any message that is sent has an identifier. Since a PCM dataset consists of a single message, the ID of the single message object in a dataset is the same as the ID of the dataset.

GML geometric primitives (inline or external) are required to have a **gml:id** attribute with a value that is unique within the file (dataset or collection). The **gml:id** values must be used as the reference for the object from another object in the same dataset or another dataset. Applications must therefore take care to generate a unique gml:id for each point encoded as coordinates.

## Dataset validation

Fields may be repeated or omitted as permitted by the XML schemas and the validation tests. Since XML schema cannot encode rules for conditional presence or attributes, these rules must be checked by other validation code in the implementation.

Schematron rules are another possibility for validation code, but are not defined in this specification since the ability of implementations to integrate Schematron validation is unknown. Implementers may create and implement their own Schematron validation rules.

## Location of Data Product Format schema Files

The schema files are available from the locations given below.

| **File** | **Description** | **Version** | **Location** |
| --- | --- | --- | --- |
| S100\_gmlProfile  S100\_gmlbase  (XSD files) | S-100 GML profile schema files | 4.0 | TBD (IHO site)  Included in distribution |
| S100\_gmlProfileLevels (XSD file) | Compliance levels schema for the S-100 GML 3.2.1 Profile | 4.0 | TBD (IHO site)  Included in distribution |
| S211 (XSD file) | S100 XML Schema for S-211 (IALA Aids To Navigation) | 1.0 | TBD (IALA-AISM web site?)  Included in distribution |
| (Examples - XML files) | S-211 example | -- | TBD (IALA-AISM web site?)  included in distribution |
| OGC GML 3.2.1 schemas (if needed) | OGC schemas for GML 3.2.1 | 3.2.1 | http://schemas.opengis.net/gml/3.2.1/ |

Table 11‑1. Data format schema file locations

## Detailed documentation of schema

The detailed documentation of the schema is in Annex B (currently a separate document enclosed with this file).

# Data Product Delivery

This clause specifies the encoding and delivery mechanisms for an S-211 dataset. Data which conforms to this product specification must be delivered by means of an exchange set.

There are only two delivery modes for PCM data – single messages and collections. In either delivery mode, the content may be encapsulated into a form suitable for transmission by a mapping called a transmission encoding. An encoding translates each of the elements of the content (e.g., exchange set) into a logical form suitable for writing to media and for transmission online. An encoding may also define other elements in addition to the exchange set contents (i.e., media identification, etc…) and also may define commercial constructs such as encryption and compression methods.

Examples: REST; MIME-encoded email; zip files.

If the data is transformed (e.g., for encryption or compression purposes) its content must not be changed.

This product specification does not define the transmission encoding which must be used as a default for transmission of data between parties.

## Message datasets

S-211 Datasets are delivered as single messages transmitted to a service broker via an appropriate delivery mechanism, e.g., REST API.

**Units of Delivery**: Message

**Transfer Size**: 10kb maximum

**Medium Name**: Synchronous Digital data delivery

**Other Delivery Information**:

Each delivery packet must contain a single PCM.

Exchange catalogues are not included.

Support files are not included.

The allowed components are as follows:

Mandatory Elements

* PCM – XML encoding of single PCM.

Optional Elements: None.

## Collections

S-211 Collections are transferred as collections of messages transmitted via an appropriate delivery mechanism, e.g., REST API.

**Units of Delivery**: Collection

**Transfer Size**: 20MB

**Medium Name**: Synchronous Digital data delivery

**Other Delivery Information**:

Each collection may contain zero or more PCM objects.

Exchange catalogues are not included.

Support files are not included.

The allowed components are as follows:

Mandatory Elements

* PCM – XML encoding of PCM features/attributes and their associated geometry and metadata.
* Collection wrapper – as specified by the service broker API.

Optional Elements: None

## Dataset distribution

### Datasets

Datasets are distributed by means of a service broker with a REST API.

**The PCM product specification does not mandate implementation of the API or service broker.**

### Dataset size

Single messages must not exceed 10kb. Collections must not exceed 20 MB.

### Dataset file naming

If PCM data is communicated in the form of dataset files containing a single port call message in each file, the files shall be named

<MESSAGEID>.XML

Where <MESSAGEID> is the UUID portion of the message ID of the message, converted to upper case.

NOTE: The letter cases of the file name and the messageID encoded within the message are not guaranteed to be the same. E.g., the internal messageID may use lower case letters, or mixed case, or may have only some letters in uppercase, etc.

## Support Files

This specification does not allow the inclusion of support files. Feature catalogues, if supplied, must be made available separately from the PCM messages and collections. Portrayal catalogues are not used.

## Exchange Catalogue

The exchange catalogue prescribed by S-100 is not used in the PCM specification and is not transmitted with PCM messages. This is to reduce demands on bandwidth and the complexity of generation and handling of PCM.

# Metadata

Metadata prescribed by S-100 is not transmitted with PCM messages. This is to reduce demands on bandwidth and the complexity of generation and handling of PCM.

For this reason there is no metadata defined in this specification.

# Language

The exchange language must be English. Other languages may be used as a supplementary option. National geographic names can be left in their original national language using the complex attribute Feature Name.

Character strings must be encoded using the character set defined in ISO 10646-1, in Unicode Transformation Format-8 (UTF-8). A BOM (byte order mark) must not be used.

# Additional Information

The combinations of time sequences, reference objects, service objects and locations corresponding to different location states, service states, and administration states are given in appendix G.

# Acknowledgements

Version 0.6 of the Port Call Message Standard is a further refinement of the Port Call Message Standard version 0.51 (December 2016) which was based on version 0.42 issued in the spring of 2016[[2]](#footnote-2) and a further refinement of the Port Call Message Standard 0.5 presented at IALA (ENAV19-6.6). The refinement has been informed by experiences from putting the standard into use in multiple instances. The refinement to this version has been a collaborative effort between Mikael Lind, Sandra Haraldson, Almir Zerem, Mathias Karlsson, Niklas Mellegård, Eddie Olsson, Robert Rylander, Isak Lindbeck, and Michael Bergmann (RISE Viktoria), Mikael Hägg (Swedish Maritime Administration), Sean Deehan, Gabriel Ferrús Clari, and José Andrés Giménez Maldonado (Valenciaport Foundation). The standard will be subject to change based on forthcoming experiences, where the ambition is to ensure backward-compatibility to this version.

1. Data Classification and Encoding Guide

[The Data Classification and Encoding is currently in a separate document enclosed with this file. See file S-211 Annex\_A]

1. Data Product Format (Encoding)

**Introduction**

This data format **does not fully conform** to the conventions for feature-based datasets in the S-100 GML profile described in S-100 Part 10b, since this standard is intended for information transfer via REST services and not as feature datasets. Specifically, the dataset structure and header structure are not used. For this reason, it does not fully conform to the rules for GML datasets. It does use the S-100 profile (and, by implication, GML) in part, specifically in the conventions for single features and complex attributes in the S-100 GML profile as well as GML spatial types (it uses only the point type). Associations are not used in this product specification.

The single feature type in this specification is **PortCallMessage**, depicted in Figure 16‑1. The attributes correspond to those defined in the application schema (section 7.3). The attributes **locationState**, **messageOperation**, **administrationState**, and **serviceState** encode the various state components defined in the application schema. They are enclosed in an XML choice element which means only one of the attributes can be used in any single **PortCallMessage** object.

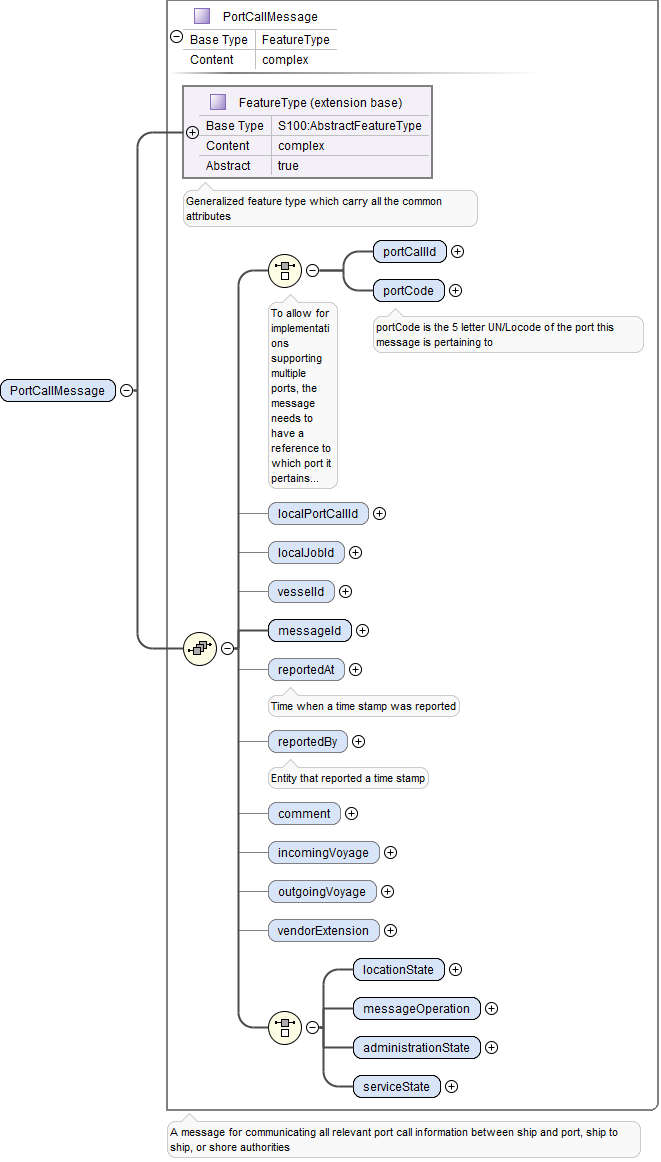


Figure 16‑1. Port Call message structure

The structure of the four alternatives for payload contents is shown in the figures that follow. The structures correspond to the complex attributes in the application schema. Note that the complex attribute **betweenLocations** contains two location attributes, for the “from” and “to” locations.

|  |  |
| --- | --- |
| Figure 16‑2. Structure of administrationState | Figure 16‑3. Structure of locationState |
| Figure 16‑4. Structure of serviceState | Figure 16‑5. Structure of messageOperation |

The format for location information is depicted in Figure 16‑6 below, and requires an MRN. (The system for identifying locations by MRNs is defined elsewhere in the STM ecosystem.) Coordinates are not used in this edition of S-211.

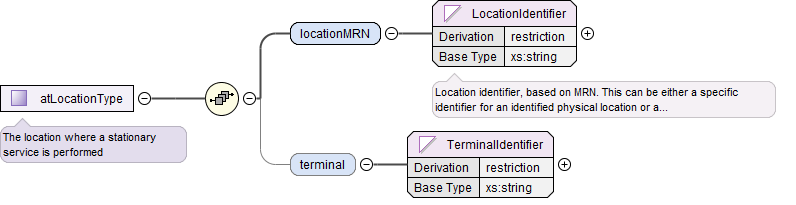


Figure 16‑6. Location information

**Data Integrity checkING**

Mandatory and optional attributes are defined by the multiplicity bounds in the XSD and correspond to the bounds in the application schema. Further validation checks are defined in Annex F.

[Detailed documentation of the XML schemas is in the accompanying Annex\_B-2 Data Format Documentation files.]

1. NORMATIVE IMPLEMENTATION GUIDANCE

*IALA to determine if this annex is needed.*

1. FEATURE CATALOGUE

*[See the accompanying printed feature catalogue Word file Annex\_D Feature Catalogue. The XML feature catalogue itself is a separate file in the product specification distribution package.]*

1. Application Schema Documentation Tables

[See file S-211 Annex\_E Application Schema Documentation.]

1. S-211 dataset validation rules

References

IHO S-58 ENC VALIDATION CHECKS Edition 6.0.0 – 2016

Abbreviations

PS – Product Specification

DCEG – Data Capture and Encoding Guide

Validation checks

The following checks are intended for production systems designed to produce S-211 Datasets and applications that consume them. This specification does not govern whether the checks must be performed at any later stage of transmission or consumption. The issue of when the checks must be performed is left for application requirements analysis, design, and implementation.

Check classification

|  |  |  |
| --- | --- | --- |
| C | Critical Error | An error which would make ~~an ENC~~ a port call message unusable through not loading or causing application software to crash or presenting data which is unsafe for navigation. |
| E | Error | An error which may degrade the quality or utility of the ~~ENC~~ port call message through appearance or usability but which will not pose a significant danger when used to support navigation. |
| W | Warning | An error which may be duplication or an inconsistency which will not noticeably degrade the usability of ~~an ENC in ECDIS~~ a port call message. |

Check application

Since there is no update dataset format defined in this specification, all checks apply to all messages that satisfy the specified condition for the check.

Checks relating to S-211 Data

Note: The checks in this appendix mention restrictions on the allowed values for enumerated attributes or pattern or range constraints only in general terms, because such restrictions are supposed to be specified in the feature catalogue. The XML schema also includes those which can be enforced by XML schema validation. E.g., state-dependent constraints on timeSequence values within the different states are not listed as validation checks in the table below, because the constraints are specified in the feature catalogue, DCEG, and XML schema. Implementers must refer to the feature catalogue and XML schema for complete details.

Note that many types of conditional checks cannot be encoded in either the feature catalogue, or XML Schema alone (that requires Schematron or code in XSLT or another language).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Check description** | **Check message** | **Check solution** | **Conformity to:** | **Class** |
| 101 | If the message size is greater than 10KB. | The message is larger than 10KB in size. | Ensure that the message is not larger than 10KB. | PS 12.1, 12.3.2 | E |
| 102 | For each port call message where the messageId is not unique. | Duplicate message identifier. | Ensure that no duplicate message identifiers exist. | PS 7.3 | C |
| 104 | If any mandatory attributes are not present. | Mandatory attributes are not encoded | Populate mandatory attributes | DCEG 2.4.2 | C |
| 105 | For each object with an attribute of type Integer where the value contains zeroes before the first non-zero digit. | Values have been padded with non-significant zeroes. | Remove non-significant zeroes. | PS 11.3 | W |
| 106 | If message does not validate against the XML schema | Dataset does not conform to the data format | Ensure conformance to the data format | PS 11 | C |
| 107 | Ensure all text fields are encoded using UTF-8 | Illegal character set used. | Change character encoding to UTF-8 | PS 11.4 | E |
| 108 | If the name of a message transferred as a file is not in accordance with the Product Specification. | File names are not in accordance with the Product Specification. | Amend file names. | PS 12.3.3 | E |
| 109 | For each message, which does not have a valid XML tag (XML local name) which is the same as the feature code as defined by the feature catalogue. | Object has invalid feature class tag. | Amend object class tag. | Logical consistency | C |
| 110 | For each attribute, which does not have a valid XML tag (XML local name) which is the same as the attribute code as defined by the feature catalogue. | Attribute has invalid attribute tag. | Amend attribute tag. | Logical consistency | C |
| 111 | For each message object, which contains attributes outside the list of permissible attributes for the feature class (as defined in the feature catalogue). | Attribute not permitted on feature object. | Remove attribute. | Logical consistency | E |
| 112 | For each attribute instance where the total number of instances exceed the permitted number of instances | Too many instances of attribute. | Ensure correct attribute encoding. | Logical consistency | E |
| 113 | If the collection size is greater than 20Mbytes | The collection is larger than 20Mbytes in size. | Ensure that the collection is not larger than 20Mbytes | PS 12.2, 12.3.2 | E |
| 114 | For each payload state that is not preceded by one of its allowed predecessor states. | Inconsistent payload state | (As specified by application requirements.) | Logical consistency | E |
| 115 | For each withdrawal message that identifies a previous message that does not exist on the system or has already been withdrawn | Withdrawn message is not present | (As specified in application requirements.) | Logical consistency | W |
| 116 | For each location state payload with neither fromLocation nor toLocation populated | location state must have at least one of from or to locations | Populate at least one of fromLocation and toLocation | PS 7.3 | C |
| 117 | For each location state payload with timeSequence=ARRIVAL\_TO and toLocation not populated | Location state must have toLocation for arrival | Populate toLocation or correct timeSequence | PS 7.3 | C |
| 118 | For each location state payload with timeSequence=DEPARTURE\_FROM and fromLocation not populated | Location state must have fromLocation for departure | Populate fromLocation or correct timeSequence | PS 7.3 | C |
| 119 | For each service state payload with atLocation and betweenLocations both populated or neither populated | service state must have exactly one of atLocation and betweenLocations populated | Ensure exactly one of atLocation and betweenLocations is populated | PS 7.3 | C |
| 120 | For each administration state payload with atLocation and betweenLocations both populated or neither populated | administration state must have exactly one of atLocation and betweenLocations populated | Ensure exactly one of atLocation and betweenLocations is populated | PS 7.3 | C |
| 121 | For each location state, administration state, or service state whose attribute values do not satisfy one of the allowed combinations listed in appendix G | State attributes do not describe an allowed state. | Correct attributes | PS 15 | C |

1. State Catalogue

The state catalogue describes what combinations of defining coordinates are regarded as valid and what states the combinations refer to.

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>  
<states xmlns="urn:mrn:stm:schema:state\_catalogue:0.7">  
 <ServiceStates>  
 <ServiceState>  
 <StateId>Anchoring\_Commenced</StateId>  
 <Name>Anchoring Commenced</Name>  
 <Description>Anchoring Operation Started</Description>  
 <ServiceType>STATIONARY</ServiceType>  
 <ServiceObject>ANCHORING</ServiceObject>  
 <TimeSequence>COMMENCED</TimeSequence>  
 <Critical>true</Critical>  
 </ServiceState>  
 <ServiceState>  
 <StateId>Anchoring\_Completed</StateId>  
 <Name>Anchoring Completed</Name>  
 <Description>Anchoring Operation Completed</Description>  
 <ServiceType>STATIONARY</ServiceType>  
 <ServiceObject>ANCHORING</ServiceObject>  
 <TimeSequence>COMPLETED</TimeSequence>  
 <Critical>true</Critical>  
 </ServiceState>  
 <ServiceState>  
 <StateId>MooringOp\_Commenced</StateId>  
 <Name>Mooring Operation Commenced</Name>  
 <Description>Mooring Operation Commenced</Description>  
 <ServiceType>STATIONARY</ServiceType>  
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 <Description>Start heaving up anchor (an anchoring spot is a berth and req/conf departure as such)</Description>  
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 <Description>Moorers has departed from berth</Description>  
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 <Name>Arrival Pilot Berth</Name>  
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 <Description>Pontoons &amp; Fenders at berth</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <Description>Pontoons &amp; Fenders removed from berth</Description>  
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 <Name>Arrival Security Berth</Name>  
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 <Name>Arrival Tug Berth</Name>  
 <Description>Tug arrived at berth</Description>  
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 <Description>Tug departed from berth</Description>  
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 <StateId>Arrival\_Vessel\_Berth</StateId>  
 <Name>Arrival Vessel Berth</Name>  
 <Description>Vessels arrived to assigned berth (could also capture anchoring area if no distinction is made between berth and anchorage area in sending system)</Description>  
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 <Description>Vessel arrived anchoring area</Description>  
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 <Description>Vessel departed anchoring area</Description>  
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 <Description>Tug arrived to tug zone (during departure) / Tug arrivals to tug zone</Description>  
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 <Description>Tug departed from tug zone</Description>  
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 <Description>Vessel arrived to tug zone (during departure) / Vessel arrives to tug zone </Description>  
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 <Name>Departure Vessel TugZone</Name>  
 <Description>Vessel departed from tug zone (with or without towage)</Description>  
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 <Description>Escort tug arrived to vessel in tug zone</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <Name>Departure EscortTug Tug Zone</Name>  
 <Description>Escort tug departed from vessel in tug zone</Description>  
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 <Description>Escort tug arrived to vessel at escort tug zone</Description>  
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 <Name>Arrival Vessel EscortTugZone</Name>  
 <Description>Vessel arrived at Escort tug zone</Description>  
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 <Description>Vessel departed from escort tug zone (with or without escort)</Description>  
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 <Description>Pilot arrived to PilotBoardingArea </Description>  
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 <Description>Pilotboat arrived to PilotBoardingArea</Description>  
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 <Name>Pilotboat Departure from Pilot Boarding Area</Name>  
 <Description> Pilotboat departed from PilotBoardingArea</Description>  
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 <Name>Arrival Vessel PilotBoardingArea</Name>  
 <Description>Vessel arrived to PBA during arrival/departure</Description>  
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 <Description>Vessel departed from PBA during arrival/departure</Description>  
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 <Name>Arrival Passenger Vessel</Name>  
 <Description>All Passengers Onboard</Description>  
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 <Name>Departure Passenger Vessel</Name>  
 <Description>All Passengers dissembarked</Description>  
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 <Description>Pilot Onboard (POB)</Description>  
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 <Description>Pilot disembark the vessel</Description>  
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 <Description>EscortTug has arrived to the vessel</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <Name>Departure Escort Tug Vessel</Name>  
 <Description>EscortTug has left vessel </Description>  
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 <StateId>Arrival\_IceBreaker\_Vessel</StateId>  
 <Name>Arrival IceBreaker Vessel</Name>  
 <Description>IceBreaker has arrived to the vessel</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <StateId>Departure\_IceBreaker\_Vessel</StateId>  
 <Name>Departure IceBreaker Vessel </Name>  
 <Description>IceBreaker departed from Vessel, mission completed, aborted</Description>  
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 <StateId>Arrival\_Tug\_Vessel</StateId>  
 <Name>Arrival Tug Vessel</Name>  
 <Description>The tugboat has arrived to the vessel</Description>  
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 <Name>Departure Tug Vessel</Name>  
 <Description>Tug and vessel has been disconnected</Description>  
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 <ReferenceObject>TUG</ReferenceObject>  
 <LocationType>VESSEL</LocationType>  
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 <Name>Bunker Vessel Alongside Vessel</Name>  
 <Description>Bunker vessel is alongside the vessel</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
 <ReferenceObject>BUNKER\_VESSEL</ReferenceObject>  
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 <Name>Bunker Vessel Departed Vessel</Name>  
 <Description>Bunker vessel has departed the Vessel</Description>  
 <TimeSequence>DEPARTURE\_FROM</TimeSequence>  
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 <StateId>Arrival\_SludgeVessel\_Vessel</StateId>  
 <Name>Sludge Vessel Alongside Vessel</Name>  
 <Description>Sludge vessel is alongside vessel</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
 <ReferenceObject>SLUDGE\_VESSEL</ReferenceObject>  
 <LocationType>VESSEL</LocationType>  
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 <Name>Sludge Vessel Departed Vessel</Name>  
 <Description>Sludge vessel has departed the vessel</Description>  
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 <StateId>Arrival\_SlopVessel\_Vessel</StateId>  
 <Name>Slop Vessel Alongside Vessel</Name>  
 <Description>Slop vessel is alongside vessel</Description>  
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 <ReferenceObject>SLOP\_VESSEL</ReferenceObject>  
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 <Name>Slop Vessel Departed Vessel</Name>  
 <Description>Slop vessel has departed the vessel</Description>  
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 <StateId>Arrival\_FreshWaterVessel\_Vessel</StateId>  
 <Name>Water Vessel Alongside Vessel</Name>  
 <Description>Water vessel is alongside vessel</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
 <ReferenceObject>FRESH\_WATER\_VESSEL</ReferenceObject>  
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 <Name>Water Vessel Departed Vessel</Name>  
 <Description>Water vessel has departed the vessel</Description>  
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 <Name>Pilot Boat Alongside Vessel</Name>  
 <Description>Pilot boat is alongside vessel</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
 <ReferenceObject>PILOT\_BOAT</ReferenceObject>  
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 <StateId>Departure\_PilotBoat\_Vessel</StateId>  
 <Name>Pilot Boat Departed Vessel</Name>  
 <Description>Pilot boat has departed the vessel</Description>  
 <TimeSequence>DEPARTURE\_FROM</TimeSequence>  
 <ReferenceObject>PILOT\_BOAT</ReferenceObject>  
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 <StateId>Arrival\_Vessel\_TrafficArea</StateId>  
 <Name>Arrival Vessel Traffic Area</Name>  
 <Description>The vessel entered the VTS Traffic area of the port</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <StateId>Departure\_Vessel\_TrafficArea</StateId>  
 <Name>Departure Vessel TrafficArea</Name>  
 <Description>Vessel departed from VTS traffic area</Description>  
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 <StateId>Arrival\_Vessel\_PortArea</StateId>  
 <Name>Arrival Vessel Port Area</Name>  
 <Description>The vessel entered the Port Area (inner line)</Description>  
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 <StateId>Departure\_Vessel\_PortArea</StateId>  
 <Name>Departure Vessel Port Area</Name>  
 <Description>The vessel departs from the Port Area (inner line)</Description>  
 <TimeSequence>DEPARTURE\_FROM</TimeSequence>  
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 <StateId>Arrival\_Tug\_HomeBase</StateId>  
 <Name>Arrival Tug HomeBase</Name>  
 <Description>Tug has arrived to Home base</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
 <ReferenceObject>TUG</ReferenceObject>  
 <LocationType>HOME\_BASE</LocationType>  
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 <Name>Departure Tug HomeBase</Name>  
 <Description>Tug has departed from Home base</Description>  
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 <Name>Arrival PilotBoat HomeBase</Name>  
 <Description>Pilot boat has arrived to Home base</Description>  
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 <Description>Pilot boat has departed to Home base</Description>  
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 <StateId>Arrival\_EscortTug\_HomeBase</StateId>  
 <Name>Arrival PilotBoat HomeBase</Name>  
 <Description>Pilot has arrived to Home Base</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <Name>Departure PilotBoat HomeBase</Name>  
 <Description>Pilot has departed from Home Base</Description>  
 <TimeSequence>DEPARTURE\_FROM</TimeSequence>  
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 <Name>Arrival IceBreaker Rendezvous Area</Name>  
 <Description>IceBreaker arrived at rendezvous area</Description>  
 <TimeSequence>ARRIVAL\_TO</TimeSequence>  
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 <StateId>Departure\_IceBreaker\_RendezvArea</StateId>  
 <Name>Departure Rendezvous Area</Name>  
 <Description>IceBreaker departed rendezvous area, with or without vessels connected.</Description>  
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 <Name>Arrival Vessel Rendezvous Area</Name>  
 <Description>Vessel Arrived at rendezvous area</Description>  
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 <Name>Departure Rendezvous Area</Name>  
 <Description>Vessel departed rendezvous area, following alone/convoy or connected to IceBreaker</Description>  
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 <Description>Icebreaker arrived to an unspecified location</Description>  
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 <Name>Departure IceBreaker LOC</Name>  
 <Description>IceBreaker departed from current LOC (unspecified) to transit to Vessel</Description>  
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 <Name>Departure Vessel LOC</Name>  
 <Description>Vessel departed from a particular (unspecified) location</Description>  
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 <Name>Arrival Pilotboat LOC</Name>  
 <Description>Pilotboat arrived to an unspecified location</Description>  
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 <Description>PilotBoath departed from current LOC (unspecified)</Description>  
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 <Description>Mooring Requested</Description>  
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1. Lind, M., et al., *Overcoming the inability to predict - a PortCDM future*, in *10th International Harbor Masters' Association Congress – Global Port & Marine Operations*. 2016: Vancouver, Canada. [↑](#footnote-ref-1)
2. Lind M., Haraldson S. et al (2016) Port Call Message Standard, version 0.42, STM Validation Project [↑](#footnote-ref-2)