**Technical service specification for the provisioning of AtoN information to endusers using the S-125 datamodel**

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# Introduction

This document is a service specification for a technical service for the provision of AtoN information for endusers, following the IALA guideline G1128.

In the context of e-navigation there are a number of maritime services, and each of these make reference to a number of associated technical services. The technical services themselves are described on three levels;

Service specification (this document)

Service design (one or more)

Service instance (one or more)

all the above documents are part of G1128, and are explained in that guideline.

The service specification (this document) includes the data model for the technical service, which in that case is taken from the S-125 product specification.

This specific technical service will probably be referenced in several maritime services including MS12 - nautical publications, and possibly also in the newly proposed MS17 on AtoN.

This service specification may be used with the Maritime Connectivity Platform (MCP), where the MCP would provide means of authentication of service providers and service consumers as well as means of service discoverability.

## Purpose of the Document

The purpose of this service specification document is to provide a holistic overview of the service and its building blocks in a technology-independent way, according to the G1128 guideline. 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 service at the logical level:

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

## Intended Readership

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

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

# 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 |  |
| ID | MRN assigned by IALA |
| Version | x.x |
| Description |  |
| Keywords | AtoN information, S-125 |
| Architect(s) |  |
| Status | Provisional |

# Operational Context

This section describes the context of the service from an operational perspective.

## Present Day Operational Context

In accordance with IHO S-12, The List of Lights and Fog Signals describe maritime signal installations on land or afloat producing light or sound signals (fog signals). In addition, these volumes contain information relating to certain other navigational aids: buoyage (day and night); signals (port signals, rescue signals, tide signals, etc.), radio-based aids (radio beacons, radar, radio navigation systems), etc. From a practical perspective, the List of Lights is intended for use by mariners as a compendium to the navigational chart for AtoN information. The present day operational context of promulgation at the component level, is depicted below:

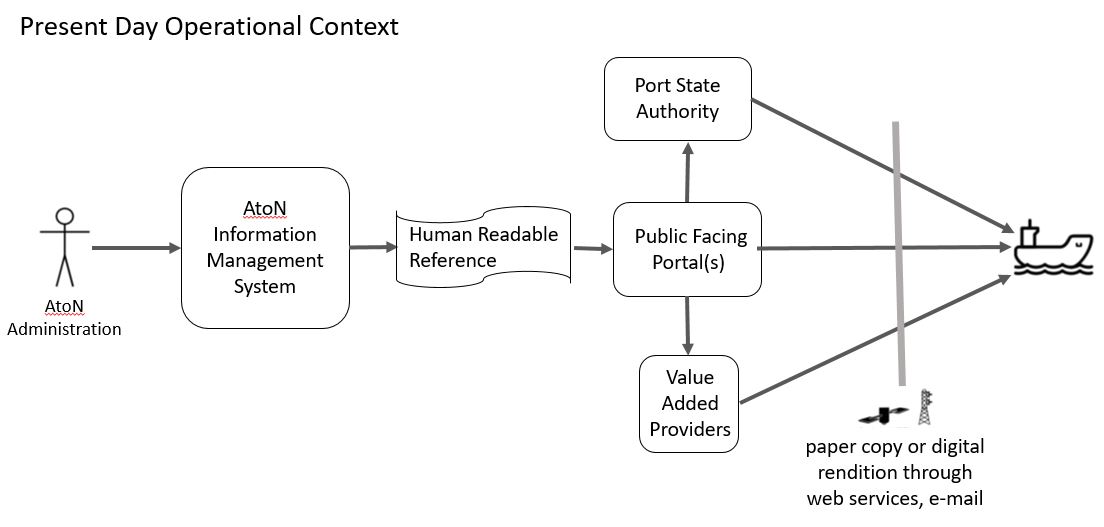


Figure 1: Present Day Operational Context

System interfaces between AtoN Administrations, Hydrographic Officers, Nautical Publication Publishers, and dissemination methods are not standardized, and may rely on manual processes involving carriage of paper print copies or human readable digital renditions obtained via web services or email. Provision of the AtoN information included within the List of Lights via web services is not standardized.

## Envisioned Operational Context

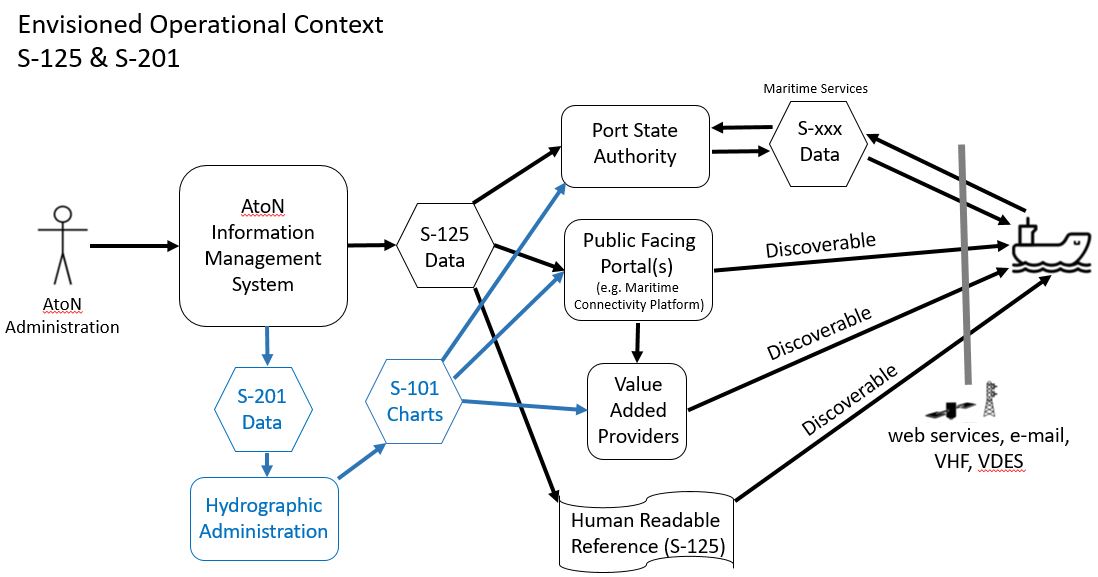
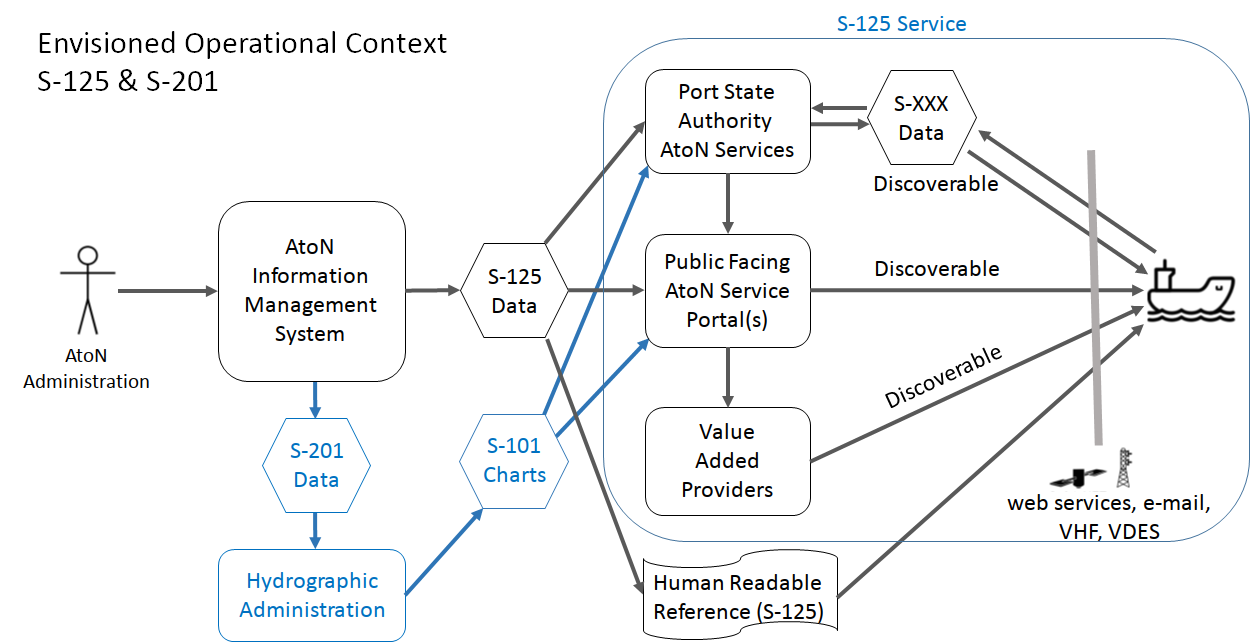
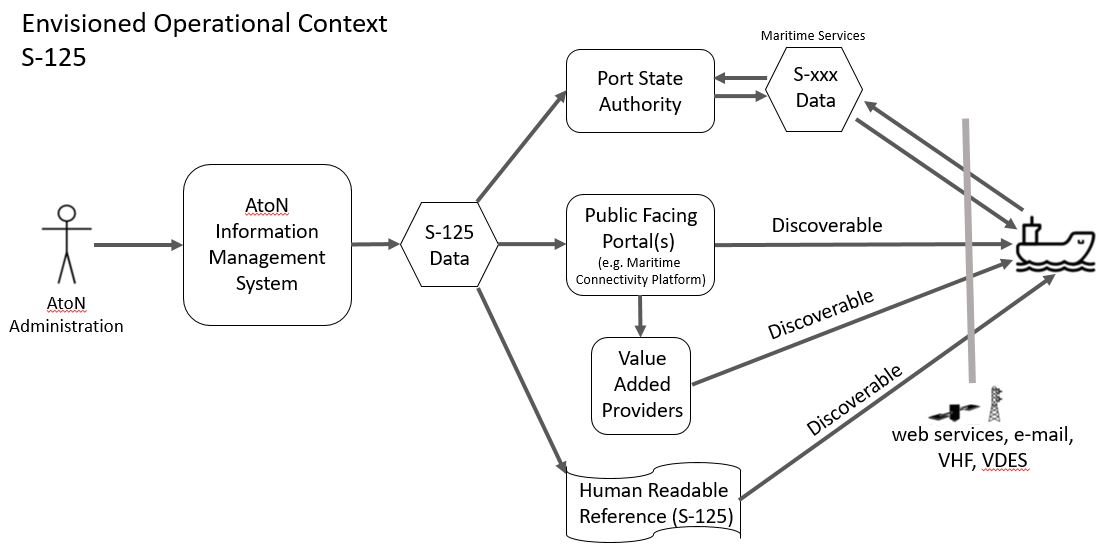
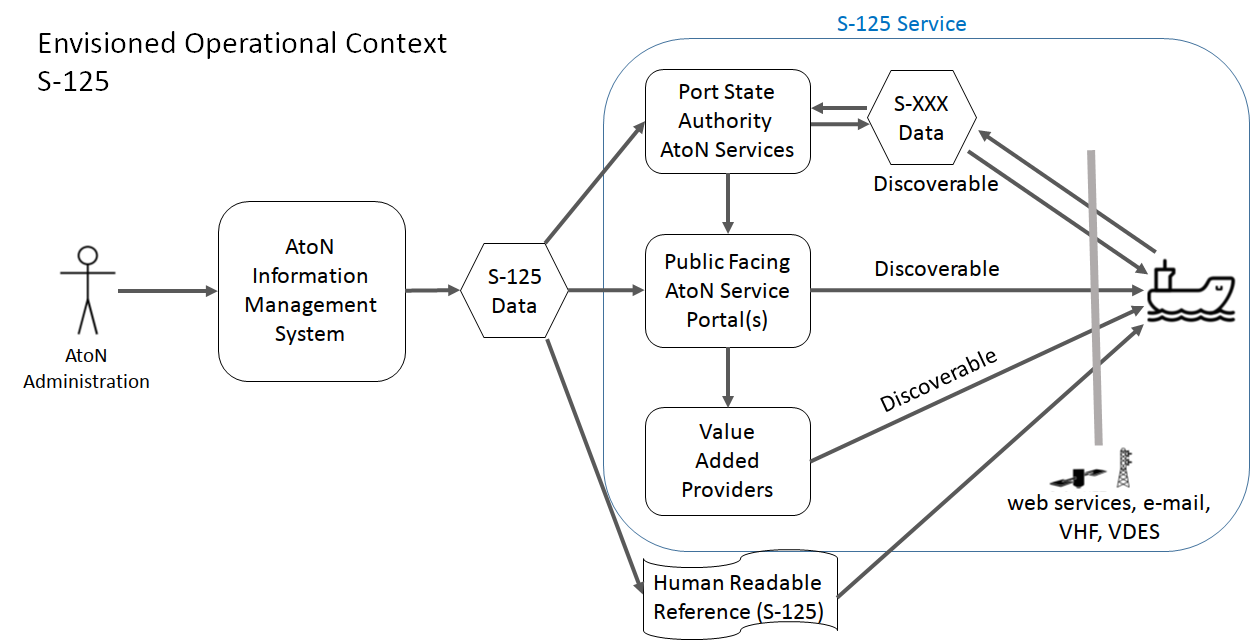


Figure 2: Envisioned Operational Context



*Alternate Diagram for Figure 2*

This scenario depicts an envisaged future of S-125 data promulgation. Based on a standardized structured AtoN information (List of Lights) format, compatible systems will be able to exchange AtoN Data seamlessly. As depicted, each AtoN Administration may have a unique AtoN Information Management System. This system should automatically promulgate S-125 Data from the authoritative source for use by national and local authorities (e.g. Port State Authorities, Harbor and port authorities), the mariner public, as well as being available for use by commercial value added services providers. The provision of “S-125 Service” described in this document, is depicted as those activities after production of the S-125 data by ATON administrations in the above diagram.

AtoN Administrations will administer and publish local S-125 Data for their area of responsibility. Where appropriate should coordinate with adjacent or overlapping AtoN administrations who share responsibility within the same waterway. (e.g. Both the U.S. Coast Guard and Canadian Coast Guard maintain aids to navigation within the waterways comprising the Great Lakes.)

Relationship of S-125 to S-201

S-201 is a standard for exchanging all information related to any AtoN including metadata like maintenance schedules, equipment types (such as battery and bulb types). S-201 is intended to be the means of communicating such information within an AtoN organization or between AtoN organization and in certain circumstances with its main partners such as hydrographic offices. S-201 is not intended to be for navigation systems like ECDIS, and therefore is not constrained by ECDIS requirements. This means the S-201 can include additional cartographic information to inform about AtoN services that would not be appropriate in a navigation system, such as positioning source confidence. Historically, positioning requirements for AtoN were divided into “High” and “Low” accuracy categories. Additionally, requirements for accuracy were influenced by “Cartographer’s Tolerance” which determined if the AtoN’s positioning accuracy was sufficient to justify advertising the aid with a closed circle navigation symbol on paper charts based upon the scale of the chart.

S-125 meanwhile, would be a derivative of S-201 service as the public facing information for use in ECDIS/ECS. In other words, S-125 would be the digital equivalent of the extended list of lights in order to meet IMO SOLAS Chapter V requirements of having list of lights on board and serve as a continually updated list of AtoN, including virtual AtoNs. Not all Hydrographic Offices have consistent AtoN Authorities, which have the capabilities or responsibilities of providing the S-125 data as a separate dataset to the ENC provided by the Hydrographic Office. In addition serving to the compendium to existing permanent and temporary AtoN facilitating voyage monitoring functions by mariners, S-125 data will also facilitate voyage planning by providing data related to proposed and advanced notice of changes to AtoN.

Discoverability and Dissemination

The S-125 data should be made available to public facing portals and be discoverable to mariners, Port State Authorities, and commercial value added providers. S-125 data should boost S-124 NW and ENC S-101 productions, especially by reducing the effort in the transformation of data, with the harmonization of data models. This could be accomplished by introducing efficient data exchange mechanism between authorities. It is envisioned that upon complying with applicable ship reporting requirements to Port State Authorities, a vessel would then receive available S-xxx data supporting Maritime Services (e.g. latest ENC S-101 updates, S-127 Marine Traffic Management, S-129 Under Keel Clearance, etc.) appropriate for their respective route. In terms of S-125 is means the exchange of data on recognition and navigational aspects of AtoN.

The S-125 Data received by ships will thus depend on the promulgation method of choice. If, say, a ship targets the website of a specific port authority; it may see only that data provided by the corresponding AtoN Administration. If, however, the ship queries for S-125 data via other non-governmental public portals, it will receive S-125 data from various national and local authorities relevant to its current position and planned routes. The S-125 Service detailed in this specification only caters for a small part of this promulgation regime. It exposes multiple service operations for machine to machine consumptions of all currently Aton Information from the targeted authority. It may be used by any client, such as a ship, a website or an app.

ECDIS Compatibility

Since S-125 is intended for ECDIS, it is required that S-125 comply with requirements of S-98, the Interoperability Catalogue Specification for ECDIS. This standard will govern how the various product layers will interact within an ECDIS. Within the IHO, S-98 is developed and maintained by S-100WG.

## Functional and Non-functional Requirements

The table below lists applicable functional requirements for the S-125 service.

Table 1: Requirements Tracing

|  |  |  |  |
| --- | --- | --- | --- |
| Requirement Id | Requirement Name | Requirement Text | References |
| **S-125R001** | Transmission of New datasets | Dataset with all current and valid AtoN Information. |  |
| **S-125R002** | Cancellation of dataset | Dataset which cancels, removes permanent AtoN information (e.g. an AtoN is disestablished) |  |
| **S-125R003** | Transmission of New dataset - Temporary Changes | Dataset with a new AtoN Information regarding temporary changes (e.g. 6 months of less) which will ultimately return to previous configuration. |  |
| **S-125R004** | Transmission of  New dataset – Cancellation of Temporary Changes | Dataset used to cancel previous AtoN Information regarding temporary change, restoring AtoN to permanently assigned configuration. |  |
| **S-125R005** | Transmission of New dataset – Proposed Changes to AtoN | Dataset with a new AtoN Information regarding Proposed Changes to AtoN which the AtoN Administration is considering. |  |
| **S-125R006** | Transmission of New dataset – Withdraw of Proposed Changes to AtoN | Dataset used to withdrawl previous AtoN Information regarding Proposed Changes to AtoN. |  |
| **S-125R007** | Transmission of New dataset – Advance Notice of Changes to AtoN | Dataset with a new AtoN Information regarding Approved Changes to AtoN which the AtoN Administration will be executing on or about a given time. |  |
| **S-125R008** | Transmission of New dataset – Withdraw of Advance Notice of Changes to AtoN | Dataset used to withdrawl previous AtoN information regarding advance notice of changes to AtoN once the changes have been executed. This data would be send simultaneous to corresponding S-125R001 representing the new permanent AtoN data. |  |
| **S-125R009** | Subscription of datasets | Service consumers must be able to subscribe to new datasets and updates. |  |

The table below defines non-functional requirements for the S-125 service.

Table 2: Non-functional Requirements Definition

|  |  |
| --- | --- |
| Requirement Id | S-125NF001 |
| **Requirement Name** | Authenticity |
| **Requirement Text** | The recipient of AtoN Information data must be able to verify the authenticity of the received datasets. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | S-125NF002 |
| **Requirement Name** | Integrity |
| **Requirement Text** | It must be clear to both service provider and consumer whether changes have been made to the AtoN Information data after the dataset was created. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | S-125NF003 |
| **Requirement Name** | Availability |
| **Requirement Text** | The service must always be available with the ability to deliver AtoN Information to its consumers. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | S-125NF004 |
| **Requirement Name** | Performance – Time behaviour |
| **Requirement Text** | The service must provide a Response to a service consumer’s request instantly. New AtoN Information must be broadcasted to the service consumers as soon as the service provider has knowledge of these. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| Requirement Id | S-125NF005 |
| **Requirement Name** | Modularity |
| **Requirement Text** | The services architecture must be constructed in such a way that individual functionality can be extended, modified or deleted, without changing the basic service architecture. |
| **Rationale** |  |
| **Author** |  |

## Other Constraints

### Relevant Industrial Standards

* *To be Developed*

### Operational Nodes

The following tables describe the operational nodes of the service.

Table 3: Operational Nodes providing the *S-124 NW* service

|  |  |
| --- | --- |
| Operational Node | Remarks |
| **AtoN Administration – AtoN Information Management System** | The AtoN Information Management System collects all AtoN Information available from its Authoritative Source (AtoN Administration). |
| **Port State Authority** | Governmental Agency responsible for overseeing vessel arrival within a respective area. Should facilitate dissemination of S-125 and other relevant S-xxx data sets |
| **Public Facing Portal (Governmental or NGO)** | S-125 and other S-xxx data sets should be made available to public facing portal by which mariners and value added service providers have access. Such portals must be discoverable. |
| **Ships** | Ships sailing in a service coverage area. |

### Operational Activities

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

Table 4: Operational Activities supported by the *XYZ* service

|  |  |
| --- | --- |
| Operational Activity | Remarks |
| **TBD** |  |

# Service Overview

## Service Interfaces

In below description the service interfaces for the S-124 service are shown.





Figure 3: S-124 service Interface Definition diagram

Table 5: Service Interface overview

|  |  |  |  |
| --- | --- | --- | --- |
|  | ServiceInterface | ExchangePattern | Definition |
| PUSH | Upload | REQUEST\_CALLBACK | Interface for uploading (pushing) information to consumer  ConsumerInterface:  Acknowledgement |
| Acknowledgement | ONE\_WAY | Interface for acknowledgement |
| PULL | Get | REQUEST\_RESPONSE | Interface to ask for (pulling) information from producer |
| Get List | REQUEST\_RESPONSE | Interface to ask for (pulling) a list of information from producer |
| SUBSCRIPTION | Subscription | PUBLISH\_SUBSCRIBE | Interface to create subscription of information  ConsumerInterface:  SubscriptionNotification  Upload |
| Subscription Notification | ONE\_WAY | Interface for notification from subscription events |
| Remove Subscription | ONE\_WAY | Interface for removal of subscription(s) |
| Get Subscription List | REQUEST\_RESPONSE | Interface to retrieve a list of active subscriptions |
| HELP | Capability | REQUEST\_RESPONSE | Interface to ask for the interface capabilities |
| Description | REQUEST\_RESPONSE | Interface to ask for a short description of the service |

# Service Data Model

This section describes the logical data structures to be exchanged between providers and consumers of the service.

Note that the S-100 specification [4] describes in its Appendix 9-B how S-100 based data models shall be formulated in XML schema format.

Included in the service data model is a full description followed by specific extracts for;

* Navigational Warning Features and Information types
* Enumerations
* Complex Attributes

For complete and updated documentation refer to the latest S-124 Product Specification (chapter 6) which can be found on the IHO website under section IRCC/ WWNWS/ S-124NW.

## Service Internal Data Model (optional)

Not to be included.

# Service Interface Specifications

This chapter describes the details of each service interface. One sub-chapter is provided for each Service Interface.

The Service Interface specification covers only the static design description while the dynamic design (behaviour) is described in chapter 7.

## Upload interface

The purpose of this interface is to upload (push) one information object to a consumer. Hence, a consumer of the message format needs to implement this interface in order to receive an information object.

### Operation



Figure 4: Upload interface

This operation is used both in single uploads and uploads during subscription. The parameter <FromSubscription> indicates true/false whether upload within or outside any subscription by the consumer.

When uploading the message, an acknowledgement can be requested which is expected to be received when the uploaded message has been delivered to end system (technical acknowledgement), and, if supported, an acknowledgement when the message has been opened (read) by the end user (operational acknowledgement).

### Operation Functionality

The operation shall be used for uploading (push) information product to a consumer. The operation expects one single information product (S-124 Dataset) in specified format as payload.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| <S-124:Dataset> | S-124:Dataset | 1 | S-124 Dataset which conforms to data product specification according to “IHO GEOSPATIAL STANDARD  FOR NAVIGATIONAL WARNINGS” |
| ExchangeMetadata | S100\_DatasetDiscoveryMetadata | 1 | The exchange metadata contains information regarding protection scheme, compression, signature and claimed identity. |
| FromSubscription | Boolean | 0..1 | Flag to indicate whether the payload has been uploaded within an active subscription or not. |
| AckRequest | Boolean | 0..1 | Flag to indicate that acknowledgement is expected when delivered, and an acknowledgement when message has been opened (read) by end user.  True if acknowledgement is requested |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| result from operation | see technical design | 1 | Reference for acknowledgement |
|  |  |  |  |

### Dependency

ConsumerInterface

* Consumes the Acknowledgement service interface, if requested.

ExchangePattern

* REQUEST\_CALLBACK if Acknowledgement is requested.

## Acknowledgement interface

Interface provided to cater for acknowledgement of received information.

### Operation



Figure 5: Acknowledgement Interface

During upload of information, an acknowledgement can be requested, when the information has been delivered to the end system by the consumer service. The acknowledgement contains reference to the information product delivered

### Operation Functionality

The operation shall be used, for uploading an acknowledgement when uploaded information product is forwarded to parent application or message opened by the operator.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| Reference | UUID | 1 | Reference to acknowledged object |
| Time | see technical design | 1 | Time when delivered or opened |
| AcknowledgementType | see technical design | 1 | Type of acknowledgement (technical delivery ACK, or operational “message opened” ACK) |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| result from operation | see technical design | 1 |  |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* ONE\_WAY

## Get Interface

The Get interface is used for pulling Navigation warnings from a service producer i.e. NAVAREA Coordinator. The owner of the information (producer) is responsible for authorization procedure before returning information. The consumer can filter for navigational Warnings by its reference, identifier, status, geometry and time.

### Operation



Figure 6: Get Interface

### Operation Functionality

The operation can be used for retrieving Navigational warnings from producer. If no parameters are given, the return is either an empty list or all navigational warnings the consumer has been granted access to by the NAVAREA Coordinator filtered according to chosen parameters.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| Reference | UUID | 0..1 | Reference to information object e.g. from Get List result. |
| S-124DatasetIdentifier | see technical design | 0..1 | The identifier can be provided as search criteria. A list of identifiers can be retrieved via Get List interface.  If no identifier provided, it's up to the service to decide what to return.  It's up to the service to apply relevant authorization procedure and access control to information. |
| Status | see technical design | 0..1 | Status can be provided as search criteria.  If no Status is provided, it's up to the service to decide what to return.  It's up to the service to apply relevant authorization procedure and access control to information. |
| Geometry | see technical design | 0..1 | Geometry condition for geolocated information objects |
| AreaName | see technical design | 0..1 | Name of defined area |
| UN/LOCODE | see technical design | 0..1 | Code of defined object |
| TimePeriod | see technical design | 0..1 | Time related to validity of information objects |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| List of Information Objects | List of < S-124:Dataset > | 0..\* | Information object(s) in return |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* REQUEST\_RESPONSE

## Get List Interface

A list of accessible information is returned from this interface. The list contains reference to the identity it can be retrieved through the Get interface, a status and a short description.

### Operation



Figure 7: Get List Interface

### Operation Functionality

The Get List interface should be used to get a list of available Navigational Warnings. These warnings are identified by their identifier, status and description. The list can also contain ‘sub-groups’ of warnings included in warnings.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| Geometry | see technical design | 0..1 | Geometry condition for geolocated information objects |
| AreaName | see technical design | 0..1 | Name of defined area |
| UN/LOCODE | see technical design | 0..1 | Code of defined object |
| TimePeriod | see technical design | 0..1 | Time related to validity of information objects |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| For each object:  Reference  S124 Identifier  Status  Description of information object | see technical design | 0..\* | List of information objects available (with access), identified by identifier, status and short description |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* REQUEST\_RESPONSE

## Subscribe Interface

The purpose of the interface is to facilitate request subscription of Navigational Warnings, filtered by specific information according to parameters, or the information decided upon by information provider.

### Operation



Figure 8: Subscribe Interface

### Operation Functionality

The Subscribe interface should be used to subscribe to Navigational Warnings. The specific NW-data is identified by the id parameter. The ids of Navigational Warnings can be retrieved by the Get List interface. If no id is specified, the consumer subscribes to updates on all NW-datasets, to subscribe on subgroups of warnings, their sub-group id needs to be provided.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| S124 Identifier | see technical design | 0..1 | Information object identifier which can be retrieved from the Get List interface |
| Status | see technical design | 0..1 | Status |
| Geometry | see technical design | 0..1 | Geometry condition for geolocated information objects |
| AreaName | see technical design | 0..1 | Name of defined area |
| UN/LOCODE | see technical design | 0..1 | Code of defined object |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| Subscription Identifier | see technical design | 0..1 | Identifier for the created subscription, if authorized. To be used in remove subscription.  If the subscription request corresponds to more than one information object, all information objects will be part of one subscription. |

### Dependency

ConsumerInterface

* Upload
* subscription Notification service interface

ExchangePattern

* PUBLISH\_SUBSCRIBE

## Remove Subscription Interface

Subscription(s) can be removed either internally by information owner, or externally by the consumer using this interface.

### Operation



Figure 9: Remove Subscription Interface

### Operation Functionality

The Remove Subscription interface should be used to request removal of Subscription(s), which were created earlier through the Subscription Interface.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| SubscriptionIdentifier | see technical design | 0..1 | Specific identifier of the information object to remove subscription for. If no id entity provided, all subscriptions for the caller are removed. |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| Result from operation | see technical design | 0..1 | Confirmation or error message |

### Dependency

ConsumerInterface

* Subscription Notification service interface

ExchangePattern

* ONE\_WAY

## Get Subscription List Interface

A list of active subscriptions, can be retrieved through this interface.

### Operation



Figure 10: Get Subscription List Interface

### Operation Functionality

This interface should be used by service consumers to retrieve a list of all information objects (identified by their id) that the requesting client is subscribing to, using the Subscription interface.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| - |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| SubscriptionIdentifier | see technical design | 0..\* | Identifier of the subscription. |
| Subscription Parameters | see technical design | 0..\* | Parameters used when creating subscription. |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* REQUEST\_RESPONSE

## Subscription Notification Interface

The interface receives notifications when subscription is created or removed by information producer.

### Operation



Figure 11: Subscription Notification Interface

### Operation Functionality

The interface receives notifications when subscription is created or removed, either internally by information owner, or externally on request.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| SubscriptionIdentifier | see technical design | 1 | Identifier of the subscription. |
| Event | see technical design | 1 | Type of event; Create, Delete |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| Result from operation | see technical design | 1 |  |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* ONE\_WAY

## Capability Interface

The purpose of the interface is to provide a dynamic method to ask a service instance at runtime what interfaces that are accessible and what payload formats and versions that are valid.

### Operation



Figure 12: Capability Interface

### Operation Functionality

This interface should be used to get a List of available capabilities of this service. This can also include any kind of Service Metadata. Please refer to S-100 sections 4a-5.7 and 14-8.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| - |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| Capability | see technical design | 1 | Description of service capabilities According to S-100 sections 4a-5.7 and 14-8. Additionally including the accepted payload format and version, and specific requirements in payload etc. |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* REQUEST\_RESPONSE

## Description Interface

The purpose of the interface is to provide a dynamic method to ask for operational/user description of the specific service instance.

### Operation



Figure 13: Description Interface

### Operation Functionality

This operation receives a request for description on the service instance.The response from the service contains how to use/consume the service instance and expected input and outcome of the service instance.

### Operation Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters (in)** | **Encoding** | **Mult.** | **Description** |
| - |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **ReturnType (out)** | **Encoding** | **Mult.** | **Description** |
| Description | see technical design | 1 | Description of the service reported at runtime by the service instance |

### Dependency

ConsumerInterface

* No dependency.

ExchangePattern

* REQUEST\_RESPONSE

# Service Dynamic Behaviour

This section describes the interactive behaviour between service interfaces and service consumers.

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

## UPLOAD Interface

Usage of upload interface is shown for use cases (perspectives) below;

* Upload message initiated from service provider to service consumer

The service producer may request acknowledgement, which is sent by the service consumer when the uploaded message was delivered successfully. The acknowledgement contains reference to the identity of the message given in the upload request.

The service provider also indicates whether the uploaded message is within a subscription, or if it is a one-time upload of data, hence no updates can be expected if not within a subscription.



Figure 14: Upload message initiated by service provider with acknowledgement.

The transmission of a S-124 message can also be initiated by the service consumer using the GET command (see below).

## ACKNOWLEDGEMENT interface

Usage of ACKNOWLEDGEMENT interface is shown for use cases (perspectives) below;

* Acknowledging the retrieval of a message sent by either the service provider or service consumer.

The Acknowledgement interface has several specific use cases and could for example be used for confirming the retrieval of uploaded data using the UPLOAD interface.

## GET interface

Usage of GET interface is shown for use cases (perspectives) below;

* Used for requesting a specific information object from the service provider. Initiated by the service consumer.

The GET interface can be used by the service consumer to request information objects (typically S-124 Information) from the service provider. For this action, the identifier of the information object is required. This identifier can for example be retrieved from the GET LIST interface (see below).



Figure 15: Get Interface sequence diagram

## GET LIST interface

Usage of GET LIST interface is shown for use cases (perspectives) below;

* Retrieves a list of accessible information objects. Initiated by the service consumer.

The service consumer asks for a list of S-124 information objects that are accessible by the external service. If no information is accessible, an empty list will be returned.

The external service can use the given identifier in the GET interface to retrieve the complete information object or use the given identity to request subscription of the information object.

Figure 16 shows a typical usage of the GET LIST interface. The service consumer requests the list of accessible information objects via the interface and directly receives a response from the service provider. Then, the service consumer selects an id from the list and requests detailed information (e.g. a complete S124 dataset) with the GET interface. This information is then sent to the client as direct response of the GET request.



Figure 16 Get List Interface Diagram

## SUBSCRIPTION interfaces

Usage of SUBSCRIPTION interfaces is shown for use cases (perspectives) below;

* The service consumer subscribes to an S-124 information object provided by the service provider, i.e. requests a subscription.
* The consumer is notified about changes in subscriptions.
* The consumer removes a subscription of an S-124 information object
* The consumer retrieves a list of all active subscriptions.

The service consumer asks for a subscription of a specific information object. Whenever an update of this object is available to the service provider, the UPLOAD interface is used to deliver this object to the service consumer. A subscription can also be removed with the REMOVE SUBSCRIPTION interface. In this case, updates are no longer delivered to the client. Directly after a SUBSCRIPTION is created or deleted a notification will be sent to the service consumer for confirmation. A list of currently subscribed information objects can be retrieved via the GET SUBSCRIPTION LIST interface.

Figure 17 illustrates the typical behaviour of subscriptions. First, a subscription is created by the service consumer with the SUBSCRIBE interface, this is confirmed by the SUBSCRIPTION CREATED NOTIFICATION. Then, whenever an update for the subscribed id is available to the service provider, the UPLOAD interface is used to push this information to the consumer. The subscription can be ended by the REMOVE SUBSCRIPTION interface and is confirmed by the SUBSCRIPTION REMOVED NOTIFICATION.



Figure 17 Subscription Requested by external service

## CAPABILITY interface

Usage of CAPABILITY interface is shown for use cases (perspectives) below;

* The service consumer retrieves all capabilities of the services provider related to S-124 information exchange.

## DESCRIPTION interface

Usage of DESCRIPTION interface is shown for use cases (perspectives) below;

* The service consumer retrieves the operational/ user description of the specific service instance. This involves information about the services ability to exchange NW information objects and semantic conditions.

# References

| Nr. | Version | Reference |
| --- | --- | --- |
| 1. Service Documentation Guidelines | 01.00 | SG\_Annex\_A\_Service\_Documentation\_Guidelines |
| 1. Document ID | xx.yy | Deliverable abc |
| 1. Maritime Resource Name |  | Maritime Resource Name, ENAV17-n.n.n |
| 1. S-100 Universal Hydrographic Data Model | 2.0.0 | S-100 –  UNIVERSAL HYDROGRAPHIC DATA MODEL  <http://www.iho.int/iho_pubs/standard/S-100/S-100_Ed_2/S_100_V2.0.0_June-2015.pdf> |
| 1. IEC draft 63173-2 ED1 | draft |  |
| 1. IALA Guideline G1128 |  | THE SPECIFICATION OF e-NAVIGATION TECHNICAL SERVICES |

# Acronyms and Terminology

## Acronyms

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

## Terminology

|  |  |
| --- | --- |
| Term | Definition |
| External Data Model | Describes the semantics of the “maritime world” (or a significant part thereof) by defining data structures and their relations. This could be at logical level (e.g., in UML) or at physical level (e.g., in XSD schema definitions), as for example standard data models, or S-100 based data produce specifications. |
| Message Exchange Pattern | Describes the principles how two different parts of a message passing system (in our case: the service provider and the service consumer) interact and communicate with each other. Examples:  In the Request/Response MEP, the service consumer sends a request to the service provider in order to obtain certain information; the service provider provides the requested information in a dedicated response.  In the Publish/Subscribe MEP, the service consumer establishes a subscription with the service provider in order to obtain certain information; the service provider publishes information (either in regular intervals or upon change) to all subscribed service consumers. |
| Operational Activity | An activity performed by an operational node. Examples of operational activities in the maritime context are: Route Planning, Route Optimization, Logistics, Safety, Weather Forecast Provision, … |
| Operational Model | A structure of operational nodes and associated operational activities and their inter-relations in a process model. |
| Operational Node | A logical entity that performs activities. Note: nodes are specified independently of any physical realisation.  Examples of operational nodes in the maritime context are: Maritime Control Center, Maritime Authority, Ship, Port, Weather Information Provider, … |
| Service | The provision of something (a non-physical object), by one, for the use of one or more others, regulated by formal definitions and mutual agreements. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or through voice communication or written processes and procedures. |
| Service Consumer | A service consumer uses service instances provided by service providers. All users within the maritime domain can be service customers, e.g., ships and their crew, authorities, VTS stations, organizations (e.g., meteorological), commercial service providers, etc. |
| Service Data Model | Formal description of one dedicated service at logical level. The service data model is part of the service specification. Is typically defined in UML and/or XSD. If an external data model exists (e.g., a standard data model), then the service data model shall refer to it: each data item of the service data model shall be mapped to a data item defined in the external data model. |
| Service Design Description | Documents the details of a service technical design (most likely documented by the service implementer). The service design description includes (but is not limited to) a service physical data model and describes the used technology, transport mechanism, quality of service, etc. |
| Service Implementation | The provider side implementation of a dedicated service technical design (i.e., implementation of a dedicated service in a dedicated technology). |
| Service Implementer | Implementers of services from the service provider side and/or the service consumer side. Anybody can be a service implementer but mainly this will be commercial companies implementing solutions for shore and ship. |
| Service Instance | One service implementation may be deployed at several places by same or different service providers; each such deployment represents a different service instance, being accessible via different URLs. |
| Service Instance Description | Documents the details of a service implementation (most likely documented by the service implementer) and deployment (most likely documented by the service provider). The service instance description includes (but is not limited to) service technical design reference, service provider reference, service access information, service coverage information, etc. |
| Service Interface | The communication mechanism of the service, i.e., interaction mechanism between service provider and service consumer. A service interface is characterised by a message exchange pattern and consists of service operations that are either allocated to the provider or the consumer of the service. |
| Service Operation | Functions or procedure which enables programmatic communication with a service via a service interface. |
| Service Physical Data Model | Describes the realisation of a dedicated service data model in a dedicated technology. This includes a detailed description of the data S-124 to be exchanged using the chosen technology. The actual format of the service physical data model depends on the chosen technology. Examples may be WSDL and XSD files (e.g., for SOAP services) or swagger (Open API) specifications (e.g., for REST services). If an external data model exists (e.g., a standard data model), then the service physical data model shall refer to it: each data item of the service physical data model shall be mapped to a data item defined in the external data model.  In order to prove correct implementation of the service specification, there shall exist a mapping between the service physical data model and the service data model. This means, each data item used in the service physical data model shall be mapped to a corresponding data item of the service data model. (In case of existing mappings to a common external (standard) data model from both the service data model and the service physical data model, such a mapping is implicitly given.) |
| Service Provider | A service provider provides instances of services according to a service specification and service instance description. All users within the maritime domain can be service providers, e.g., authorities, VTS stations, organizations (e.g., meteorological), commercial service providers, etc. |
| Service Specification | Describes one dedicated service at logical level. The Service Specification is technology-agnostic. The Service Specification includes (but is not limited to) a description of the Service Interfaces and Service Operations with their data S-124. The data S-124 description may be formally defined by a Service Data Model. |
| Service Specification Producer | Producers of service specifications in accordance with the service documentation guidelines. |
| Service Technical Design | The technical design of a dedicated service in a dedicated technology. One service specification may result in several technical service designs, realising the service with different or same technologies. |
| Service Technology Catalogue | List and specifications of allowed technologies for service implementations. Currently, SOAP and REST are envisaged to be allowed service technologies. The service technology catalogue shall describe in detail the allowed service profiles, e.g., by listing communication standards, security standards, stacks, bindings, etc. |
| Spatial Exclusiveness | A service specification is characterised as “spatially exclusive”, if in any geographical region just one service instance of that specification is allowed to be registered per technology.  The decision, which service instance (out of a number of available spatially exclusive services) shall be registered for a certain geographical region, is a governance issue. |

1. Service Specification XML

This appendix contains the formal definition of the service specification.

To be done.