Technical Service Specification for the INTER-VTS EXCHANGE FORMAT (IVEF) Service

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N/A

# Introduction

This document contains the service specification for inter VTS exchange of information. It is structured according to the IALA Guideline G1128: THE SPECIFICATION OF e-NAVIGATION TECHNICAL SERVICES.

## Purpose of the Document

The IVEF Service aims to establish a unified framework facilitating the seamless exchange of the vessel traffic situation among shore-based maritime systems, including VTS systems, maritime stakeholders, and relevant external entities and authorities.

This service specification document presents a comprehensive overview of the IVEF Service and its constituent building blocks in a technology-independent manner. It adheres to the guidelines in the reference “XX”, and provides a foundation for the service.

The key aspects of the IVEF Service at the logical level are:

* the operational and business context of the service
  + requirements for the service (e.g., information exchange requirements)
  + involved nodes: which operational components provide/consume the service
  + operational activities supported by the service
  + relation of the service to other services
* the service description
  + service use cases
  + service operational sequence
  + logical operations
  + logical data model
  + dynamic behaviour

## Intended Readership

The document is aimed at the system architects, system engineers and developers in charge of designing and developing the IVEF Service, and/ or services related to the IVEF Service.

## Inputs from Other Sources (Related relevant documents)

N/A

The IVEF Service is a gateway service, as contained in the general description of the common shore-based system architecture in the '*IALA Recommendation on Shore-based e-Navigation System Architecture'* [see reference [XX]]. Such a gateway service is specialised in data exchange shore-to-shore. It interfaces to other e-Navigation systems and to external systems of 'third parties'. These systems may request the IVEF service to forward relevant data to them. A IVEF service can interface shore-based systems locally, nationally, regionally, and globally.

# 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 | Inter- VTS Exchange Format Service |
| ID | urn:mrn:iala:ivefs:vts:ivef  [not official designation, for example only] |
| Version | 1.0 |
| Description | The IVEF Technical Service Specification describes a standardized seamless exchange format of vessel traffic situation among shore-based maritime systems. |
| Keywords | VTS, IVEF, vessel traffic situation, interface format, S-210 |
| Architect(s) |  |
| Status | Ready for testing |

# Operational Context

## Introduction

IMO resolution A.1158(32) Guidelines for Vessel Traffic Services specifically states "Effective harmonized data exchange and information-sharing is fundamental to the overall operational efficiency and safety." The IVEF Service supports such harmonized data exchange and information sharing between shore-based maritime systems.

The IVEF is a technical service which supports the IMO-defined VTS Service.

The IALA Recommendation 0145

Check any IALA Documents (Recommendations, Guidelines) related to S-210 should be introduced.

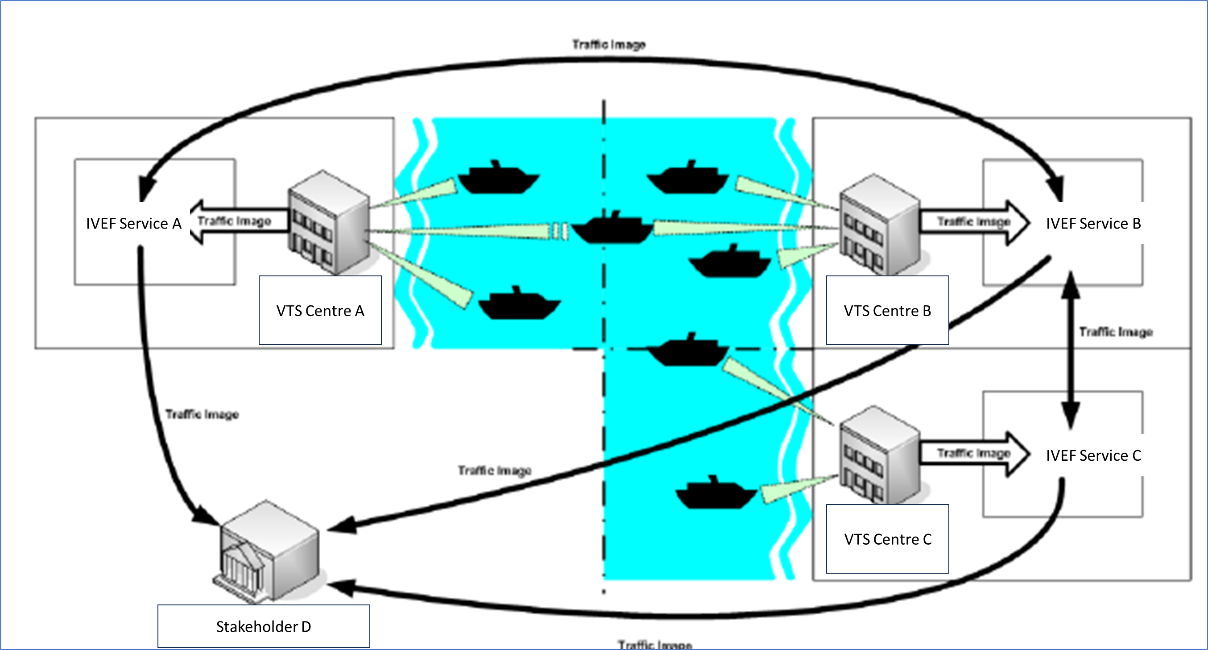
Consider to put word “Automatic”

This section provides the following:

* operational model
  + how the IVEF service supports interaction among operational nodes
    - an overview about which operational nodes shall provide the service and which operational nodes will consume the service.
    - A more detailed description stating what operational activities the IVEF service supports in a process model.
* a simple high-level use case
* functional and non-functional requirements at high level (business/regulatory requirements, system requirements, user requirements, information exchange requirements)

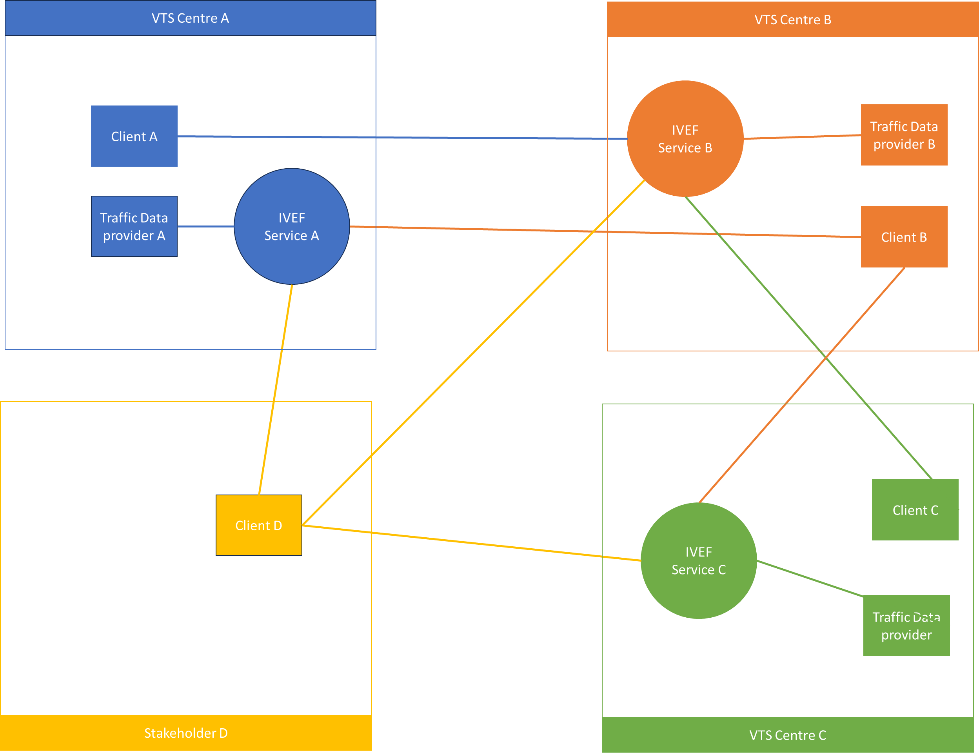
## Operational model

In the drawn operational model (refer to Figure 1), VTS centres provide vessel traffic information to other stakeholders, e.g. other VTS centres and allied services. The data exchange is based on the standardized interface for the vessel traffic information as described in this document. In addition, it is recommended that the data provider and client agree on the conditions and level of service.



1. The IVEF Service operational model

The Figure below describes IVEF data clients and providers in more abstract way. From the IVEF Service perspective, it is identical to figure one above. It shows that the data providers may also act as a client to other Providers. Also, one IVEF Service provider may service multiple clients at the same time each having their own, possibly different, service definitions.



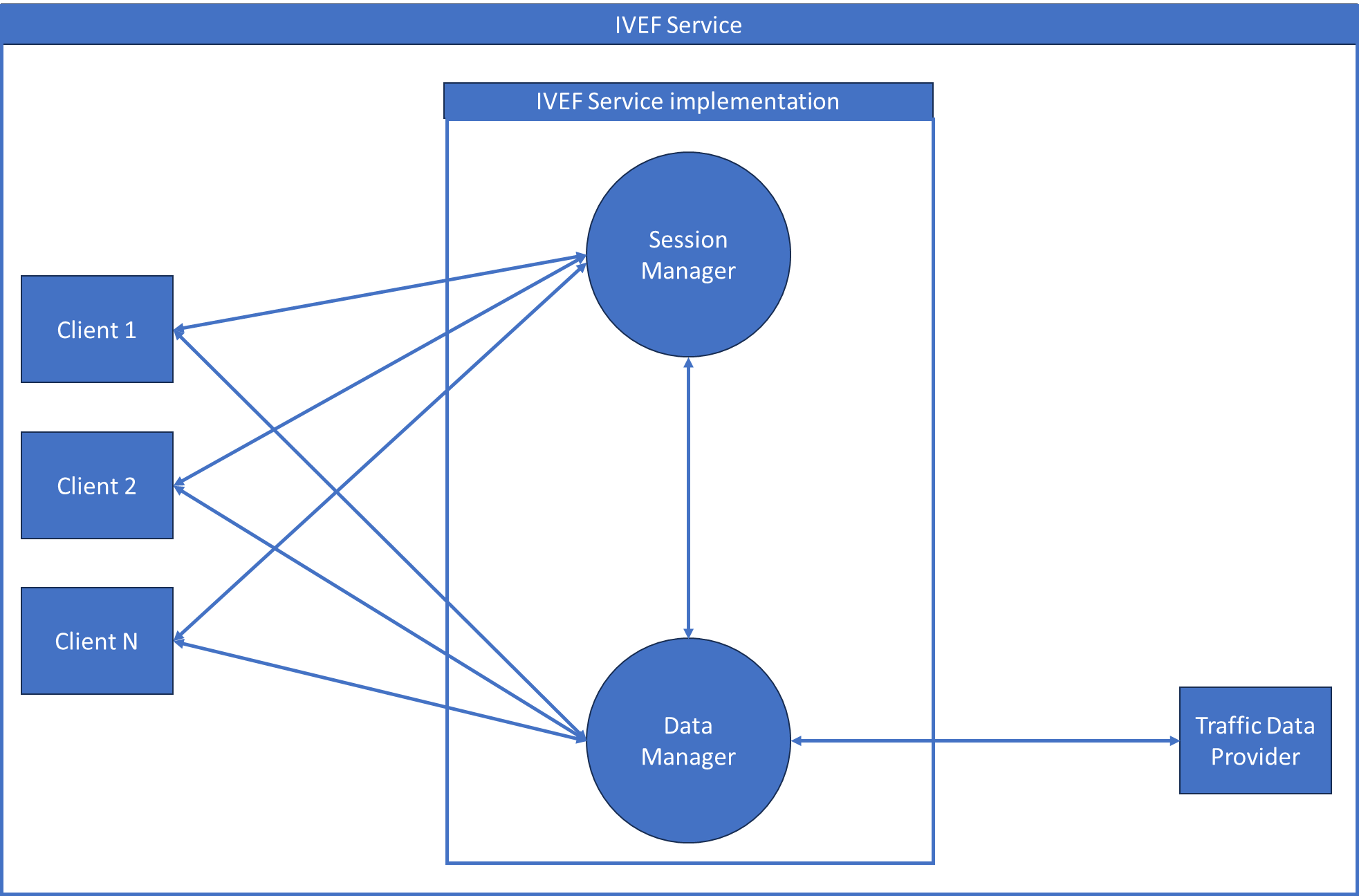
1. Abstraction of the IVEF Service clients and providers

If S-210 deal with the S-421 information, this should be mentioned here.

No relation to ECDIS should be mentioned.

## Operational nodes

The Operational Nodes involved in the IVEF Service are shown in the Figure XX and further defined in Table XX. Note that there may be multiple Client Operational Nodes in the IVEF Service.



1. Operational Nodes of the IVEF Service
2. The IVEF Service Operational Nodes

|  |  |
| --- | --- |
| Operational Node | Remarks |
| Client | Client may be other VTS centres or stakeholders who wish to obtain traffic data to support their operations |
| Data Manager | Data Manager is a part of implementation of the IVEF Service. It is responsible for obtaining the traffic data from the Traffic Data Provider and distributing the obtained traffic data to all active Clients in accordance with their service definitions. |
| Session Manager | Session Manager is a part of implementation of the IVEF Service. It is responsible for establishing the service for a particular Client. It takes care of the administrative aspect of the IVEF Service. |
| Traffic Data Provider | Traffic Data Provider an entity that creates and maintains an up-to-date traffic situation. In most cases, the traffic data is obtained from a Core VTS System. |

## Use cases

The following Use Cases demonstrate where the IVEF Service supports VTS- and stakeholder operations.

Use Case 1 – Exchange of traffic situation between VTS A and B

1. A and B have areas of interest which overlap
2. A obtains a situational awareness of the common area
3. B also obtains a situational awareness of the common area
4. A and B agree on the data to be exchanged and their respective responsibilities: where is A data used and where is B data used
5. Both A and B implement an IVEF Service, which includes user administration and other support functions
6. Both A and B initiate the session of the IVEF
7. Both A and B exchange the traffic situation of the common area
8. Both A and B make use of the extended situational awareness and present the traffic situation including the common area

Use Case 2 – Customs want to have information on a vessel of interest heading to port A until the vessel is berthed

1. Customs and VTS have an agreement that Customs can access (as a client) the IVEF Service of VTS of port A
2. Customs initiates a session with the VTS IVEF Service
3. Customs requests the information of the vessel of interest through the IVEF Service
4. The VTS IVEF Service provides information requested
5. Customs terminates the session when the vessel is berthed in port A

## Overall dataflow

This may not necessary, see the chapter 6 or 7, the sequence diagrams.

## Functional and Non-functional Requirements

### Functional requirements

|  |  |
| --- | --- |
| **Requirement Id** | IVEFFR001 |
| **Requirement Name** | IVEF Data Service |
| **Requirement Text** | IVEF Service shall provide maritime traffic data. |
| **Rationale** | This is the prime purpose of the IVEF Service. |
| **Author** | TF |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFFR002 |
| **Requirement Name** | IVEF Traffic Data Provider Restrictions |
| **Requirement Text** | IVEF takes into account any restrictions on the data delivery set by the Traffic Data Provider. |
| **Rationale** | The data delivery should respect the agreement made between Client and Traffic Data Provider. This may include filtering of the traffic data. |
| **Author** | PM |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFFR003 |
| **Requirement Name** | IVEF Client Service Definitions |
| **Requirement Text** | The Service shall provide traffic data according to the Client specifications. |
| **Rationale** | The Client may have preferences on the content and the timeliness of the service. |
| **Author** |  |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFFR004 |
| **Requirement Name** | IVEF Client Service Access |
| **Requirement Text** | The IVEF Service shall only provide maritime traffic data to legitimate Clients. |
| **Rationale** | The IVEF Service may concern sensitive data. Therefore, the access to the data should be limited to legitimate Clients only. Secondly, it shall be possible to enforce the agreed conditions for access to the data. This implies that the IVEF Service should be able to identify Clients. |
| **Author** |  |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFFR005 |
| **Requirement Name** | IVEF Traffic Data Provider Service Access |
| **Requirement Text** | The IVEF Service shall be able to obtain maritime traffic data from a legitimate Traffic Data Provider. |
| **Rationale** | The IVEF Service needs to acquire data from a trusted and reliable Traffic Data Provider. |
| **Author** |  |

### Non-functional requirements

|  |  |
| --- | --- |
| **Requirement Id** | IVEFNF001 |
| **Requirement Name** | Authenticity |
| **Requirement Text** | The Client and IVEF Traffic Data Manager must be able to verify the authenticity of the received data and source of the data. |
| **Rationale** | The Client needs to be able to verify to be connected to the correct IVEF Service.  The IVEF Traffic Data Manager needs to be able to verify to be connected to the correct Traffic Data Provider. |
| **Author** |  |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFNF002 |
| **Requirement Name** | Integrity |
| **Requirement Text** | The data connections should guarantee the integrity of the data transmission. |
| **Rationale** |  |
| **Author** |  |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFNF003 |
| **Requirement Name** | Availability |
| **Requirement Text** | The IVEF service must meet the agreed availability of the service figures. |
| **Rationale** | The service availability figures should consider operational hours and type of data exchange. |
| **Author** |  |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFNF004 |
| **Requirement Name** | Performance |
| **Requirement Text** | The IVEF service must meet the agreed performance of the service figures. |
| **Rationale** | The service performance figures should consider latency and timeliness according to the service level agreement. |
| **Author** |  |

|  |  |
| --- | --- |
| **Requirement Id** | IVEFNF005 |
| **Requirement Name** | Reliability |
| **Requirement Text** | Not applicable |
| **Rationale** | This requirement is maintained for completeness of the Performance non-functional requirements only.  The IVEF Service does not change in any way data from the Traffic Data Provider. |
| **Author** |  |

## Other Constraints

### Relevant Industrial Standards

|  |  |  |  |
| --- | --- | --- | --- |
| **Nr.** | **Standard** | **Version** | **Reference** |
| [1] | IALA Guideline G1128 | ED 1.5  (draft) | The Specification of E-navigation Technical Services |
| [2] | IALA Guideline G1143 | ED 3.1 June 2021 | Unique identifiers for maritime resources (MRN) |
| [3] | IHO Standard S-100 | ED 5.X.X Month 202X | IHO Universal Hydrographic Data Model |
| [4] | S-210 Product Specification | 0.7 (draft) |  |
| [5] | IEC S-421 | ED 1.0 | Route Plan based on S-100 (IEC 63173) |
| [6] | IALA  Recommendation |  |  |
| [7] | IALA  Guideline |  |  |

# Service Overview

## Logical Operations

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Operation** | **Description** | **Required** | |
|  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

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

## Logical Parameters

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

# Service Data Model

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

For complete and updated documentation of the S-212 data model refer to the latest S-212 Product Specification which can be found at IALA S-200 Data modelling web site <https://www.iala-aism.org/technical/data-modelling/iala-s-200-development-status/s-212/>

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

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



1. IVEF Service data model diagram

The description of the data model is as follows:

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

# Service Dynamic Behaviour

This section describes the interactive behaviour of the IVEF Service. This interactive behaviour can be split into:

* Client - IVEF Service Session Manager / IVEF Service Data Manager interaction and
* IVEF Service Data Manager - Traffic Data Provider interaction

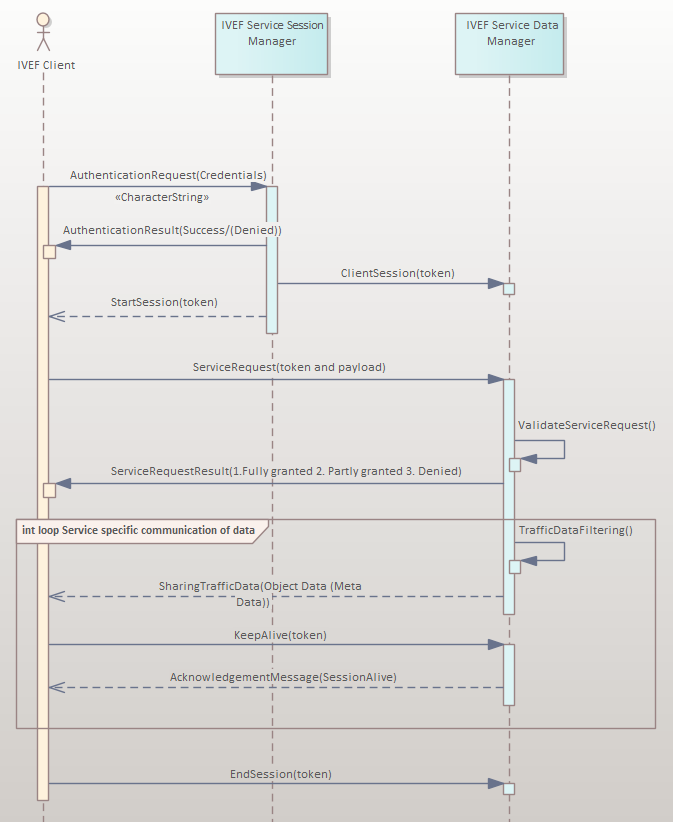
## Client - IVEF Service Session Manager / IVEF Service Data Manager interaction

This Diagram describes interaction between the Client and the IVEF Service Session Manager and, subsequently, the IVEF Service Data Manager.

The interaction between the Client and the IVEF Service Session Manager and IVEF Service Data Manager concerns authentication of the client and the setup of the data distribution.

The interaction between the Client and IVEF Service Data Manager concerns the validation of requested data distribution and actual data distribution. Depending on the agreed client service profile, the actual data distribution may need filtering.

The diagram also shows the interaction between IVEF Service Session Manager and IVEF Service Data Manager and keep-alive for the continuity of the service.



1. Client IVEF Service Sequence Diagram

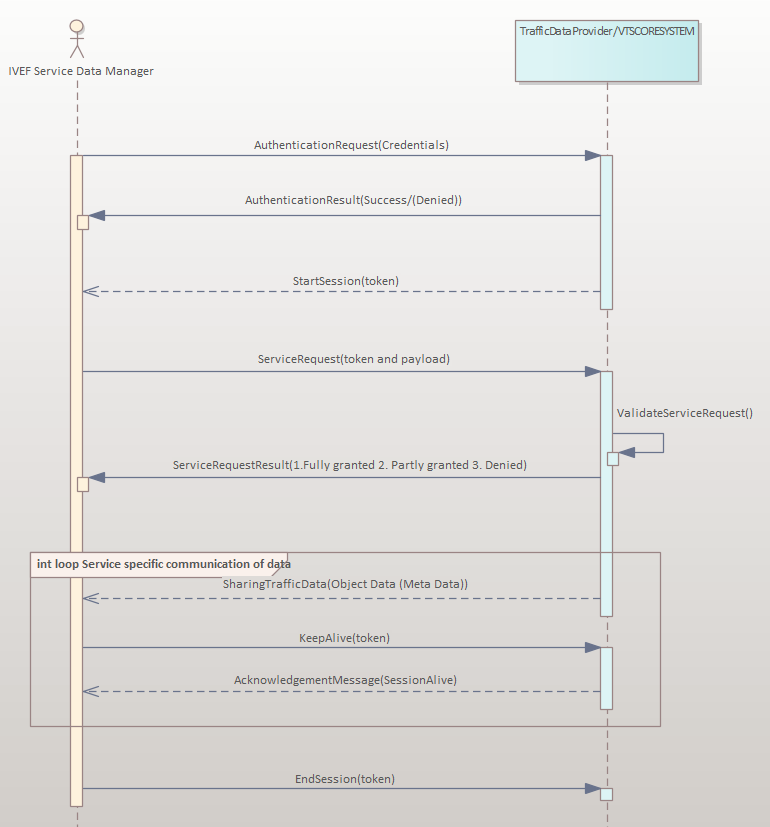
## IVEF Service Data Manager and Traffic Data Provider interaction

This Diagram describes interaction between the IVEF Service Data Manager and the Traffic Data Provider.

The interaction between the IVEF Service Data Manager and the Traffic Data Provider concerns:

* where necessary, authentication of the IVEF Service Data Manager,
* validation of the maritime traffic data collection request,
* actual data collection, and
* keep-alive for the continuity of the traffic data collection.

(The “SharingTrafficData” may need to rephrase as “CollectingTrafficData”in the Diagram)



1. IVEF Service Data Manager Sequence Diagram

# References

| Nr. | Version | Reference |
| --- | --- | --- |
| 1. IALA Guideline G1128 | ED 1.5 (draft) | THE SPECIFICATION OF E-NAVIGATION TECHNICAL SERVICES |
| 1. IALA Recommendation R1023 | ED 1.0 | MARITIME RESOURCE NAMES |
| 1. IALA Recommendation R0145 | ED 2.0 | The Inter-VTS Exchange Format (IVEF) Service |
| 1. IHO Standard S-100 | ED 5.1.0 | IHO Universal Hydrographic Data Model |
| 1. IALA data model S-210 | 0.5 (draft) | IALA Inter-VTS exchange format Product Specification |

# Acronyms and Terminology

## Acronyms

|  |  |
| --- | --- |
| Term | Definition |
|  |  |
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|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

## Terminology

|  |  |
| --- | --- |
| Term | Definition |
| Operational Node | A logical entity that performs activities. Note: nodes are specified independently of any physical realisation.  Examples of operational nodes in the maritime context are: Maritime Control Center, Maritime Authority, Ship, Port, Weather Information Provider, … |
| Service | The provision of something (a non-physical object), by one, for the use of one or more others, regulated by formal definitions and mutual agreements. Services involve interactions between providers and consumers, which may be performed in a digital form (data exchanges) or through voice communication or written processes and procedures. |
| Service Consumer | A service consumer uses service instances provided by service providers. All users within the maritime domain can be service customers, e.g., ships and their crew, authorities, VTS 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 Interface | The communication mechanism of the service, i.e., interaction mechanism between service provider and service consumer. A service interface is characterised by a message exchange pattern and consists of service operations that are either allocated to the provider or the consumer of the service. |
| Service Operation | Functions or procedure which enables programmatic communication with a service via a service interface. |
| Service Physical Data Model | Describes the realisation of a dedicated service data model in a dedicated technology. This includes a detailed description of the data S-212 to be exchanged using the chosen technology. The actual format of the service physical data model depends on the chosen technology. Examples may be WSDL and XSD files (e.g., for SOAP services) or swagger (Open API) specifications (e.g., for REST services). If an external data model exists (e.g., a standard data model), then the service physical data model shall refer to it: each data item of the service physical data model shall be mapped to a data item defined in the external data model.  In order to prove correct implementation of the service specification, there shall exist a mapping between the service physical data model and the service data model. This means, each data item used in the service physical data model shall be mapped to a corresponding data item of the service data model. (In case of existing mappings to a common external (standard) data model from both the service data model and the service physical data model, such a mapping is implicitly given.) |
| Service Provider | A service provider provides instances of services according to a service specification and service instance description. All users within the maritime domain can be service providers, e.g., authorities, VTS stations, organizations (e.g., meteorological), commercial service providers, etc. |