**Inter-VTS Exchange Format Service**

**(IVEF service)**

**S-100 Product Specification of the IVEF service**

**04 January 2016, Draft**

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# 1 OVERVIEW

## Introduction

This product specification serves two purposes. The first is to describe which data IVEF services and how to retrieve the data. The second is to describe an IVEF service and the requirements of an IVEF service. The latter can be used to build an IVEF service or to check whether an IVEF service complies to the IVEF standard.

## References

### 1.2.1 Normative references

[IVEF] IALA Recommendation V-145 - the Inter-VTS Exchange Format (IVEF) Service, June 2011

[IALA S-100] IALA Guideline No. 1106 on Producing an IALA S-100 Product Specification, Edition 1 December 2013.

[IVEF IALA XSD] IVEF\_IALA\_V-145.xsd version 0.2.5

### 1.2.2 Informative references

IALA enav17.9.9 - On extending the S-100 framework for streaming data services, Author/Submitter Eivind Mong.

## Terms, definitions and abbreviations

### 1.3.1 Terms and Definitions

The following terms and definitions are in addition to those in S-100 Annex A.

|  |  |
| --- | --- |
| Message | In this product specification, a message is defined to be one (ObjectData) file containing real time Vessel Traffic Image data. Which data is in the content of the message is dependent on the user and his subscription (configuration). |
| Dataset | In this product specification, the dataset is defined to be the Vessel Traffic Image data which is available at the IVEF service (combination of the AIS data received by the IVEF service). This dataset changes in time when data is added, updated and removed. |
| Service | In this product specification, the service is defined to be the basic IVEF service, which is the Vessel Traffic Image Data Exchange Service. This service contains three components, each handling other types of data:  - Session component: Handling session data (Login, Login response, Logout).  - Service component: Handling service data (Ping, Pong, Status).  - Data component: Handles Vessel Traffic Image data (Service request, Service request response, Object data) |

### 1.3.2 Abbreviations

|  |  |
| --- | --- |
| IALA-AISM | International Association of marine aids to navigation and Lighthouse Authorities |
| CRS | Coordinate Reference System |
| ECDIS | Electronic Chart Display Information System |
| EPSG | European Petroleum Survey Group |
| ENC | Electronic Navigational Chart |
| IHO | International Hydrographic Organization |
| IMO | International Maritime Organization |
| ISO | International Organization for Standardization |
|  |  |
| AIS | Automatic Identification System |
| IVEF | Inter-VTS Exchange Format |
| SLA | Service Level Agreement |
| VTS | Vessel Tracking System |

## Product specification metadata

|  |  |
| --- | --- |
| Title | Inter-VTS Exchange Format (IVEF) Edition 1 June 2011 |
| Version | 0.0.1 |
| Identifier | <X-### unique IALA identifier> |
| S-100 Version | 2.0.0 |
| Date | 17-12-2015 |
| Language | English |
| 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 | <http://registry.iho.int/s100\_gi\_registry/ProductSpecificationRegister/ps\_home.php> |
| Maintenance | The product specification is maintained by IALA-AISM and amendments are performed on a needs base, up to maximum one new release per calendar year. |

### 1.1.5 IALA Product Specification Maintenance

#### 1.1.5.1 Introduction

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

#### 1.1.5.2 New Edition

New editions of 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.

#### 1.1.5.3 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.

#### 1.1.5.4 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.

#### 1.1.5.5 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**

# 2 SPECIFICATION SCOPES

|  |  |
| --- | --- |
| Scope identification | Vessel Traffic Image message |
| Level | 00X |
| Level name | Message (feature or tile according MD\_ScopeCode ISO19115) |

|  |  |
| --- | --- |
| Scope identification | Vessel Traffic Image data as present in at the IVEF service |
| Level | 001 |
| Level name | Dataset |

|  |  |
| --- | --- |
| Scope identification | Basic Vessel Traffic Image Service of IVEF |
| Level | 003 |
| Level name | Service |

# 3 DATA PRODUCT IDENTIFICATION

An IVEF service has one dataset product. This is the Vessel Traffic Image data which is available at the IVEF service. A dataset is a actually a snapshot of the live Vessel Traffic Image data and continuously changes in time.

**Dataset: Vessel Traffic Image data**

|  |  |
| --- | --- |
| Title | IVEF Vessel Traffic Image data |
| Abstract | IVEF service always provides the latest (continuously changing) Vessel Traffic Image data. This Vessel Traffic Image data contains data on the position of vessels (trackdata), information on the vessels itself (vessel data) and the voyage data of the vessels (voyage data). |
| Topic Category | Transportation (MD\_TopicCategoryCode (ISO 19115)) |
| Geographic Description | See spatial extent. |
| Spatial Extent | Description: Global  East Bounding Longitude: -180  West Bounding Longitude: 180  North Bounding Latitude: 90  South Bounding Latitude: -90 |
| Spatial Resolution | IVEF does not limit the precision of a position. IVEF supports xs:decimal for its position information. The precision is as precise as the AIS position providers (the AIS on the vessels). In practice, decimals with a precision of 5 ("lat":51.46223,"long":3.26850) are used. |
| Purpose | IVEF Vessel Traffic Image data is part of eNavigation [link to eNavigation]. Vessel Traffic Image data contains the data of vessel traffic which is exchanged between users of Vessel Traffic Image data as well as between IVEF services (VTS instances). |
| Language | English |
| Spatial Representation Type | 001 - vector  In IVEF the only geographical data is the position of vessels (point data). |
| Point of Contact | NOT APPLICABLE for IVEF, since there are many VTS Centres involved. IVEF is a specification of the IVEF service, not an IVEF service itself. |
| Use Limitation | The IVEF Vessel Traffic Image data provides only the latest Vessel Traffic Image data. Older Vessel Traffic Image data is not supported. To be able to use IVEF Vessel Traffic Image data, a live connection with an IVEF service is necessary. |

# 4 DATA CONTENT AND STRUCTURE

## Introduction

The Vessel Traffic Image data (dataset) which is available at the IVEF services, is exchanged/communicated to other IVEF services via messages containing parts of the Vessel Traffic Image data. The content of these messages and the structure of the messages are described in this chapter.

## Application Schema

There are two ways an IVEF service sends out Vessel Traffic Image (VTI) data to its users.

1. By a subscription on updates.
2. By a one-time request with a query.

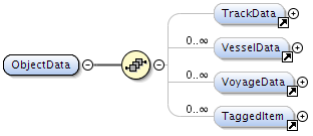
In both situations a Vessel Traffic Information message with the requested data is constructed by the IVEF service and send to its user. The data model of the Vessel Traffic Information message is described below, in 4.2.1. *ObjectDatas* is the root element of the message, which is in XML.

In this section (application schema) the structure of the VTI messages is described.

### 4.2.1 ObjectData(s) element



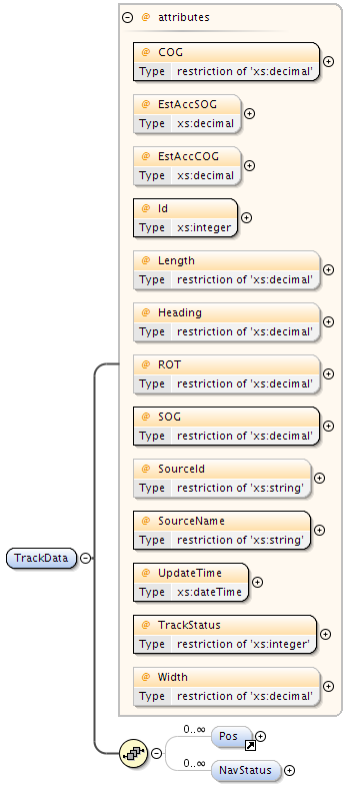
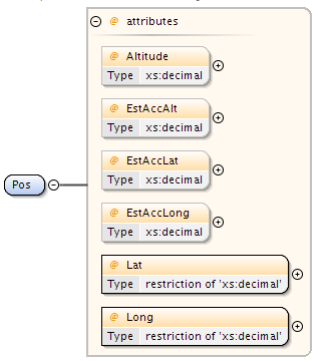
The Vessel Traffic Information consist of multiple *ObjectData* element. The *ObjectData* elements are contained in an element called *ObjectDatas*.



One *ObjectData* element consists the data belonging to one vessel- voyage-track combination. For example: A vessel moves from A to B on day D. When the vessel has started his movement, information of this movement will be available. Information on the vessel for that specific movement is to be found in the *VesselData* element. Information on the movement is to be found in the *VoyageData* element. The latest position of the vessel while making the movement is to be found in the *TrackData* element. Additional information on the movement is to be found in the *TaggedItem* element.

### 4.2.2 TrackData element

The *TrackData* element describes a report of the position of the object (usually a vessel).





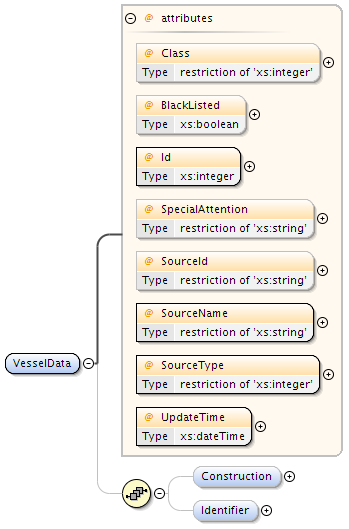
The *TrackData* element consists of the report data of the position of an object as well as a *Pos* element and a *NavStatus* element.

The *Pos* element consists of the position measurement of the geometrical centre of the object or location.

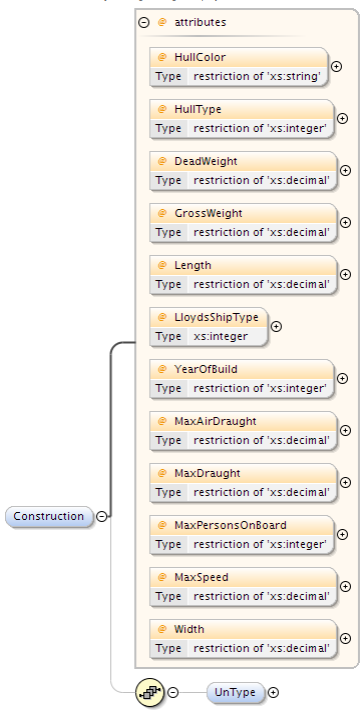
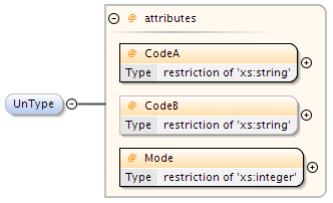
The *NavStatus* element consists of the current status of the voyage the vessel is taking.

### 4.2.3 VesselData element

The *VesselData* element consists of the static data of the object (usually a vessel).

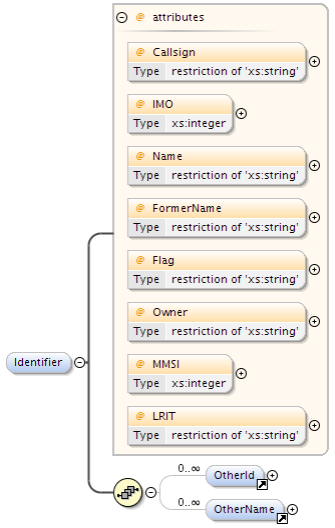
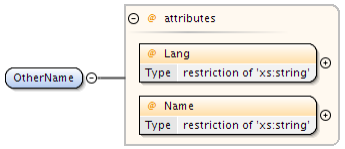
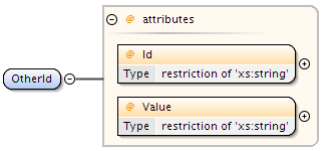


The *VesselData* element consists of the static data of an object as well as a *Construction* element and an *Identifier* element.



The *Construction* element consists of the physical construction data of the object (usually a vessel) and an *UnType* element.

The *UnType* element contains the type of the vessel, according to CODES FOR TYPES OF MEANS OF TRANSPORT Revision 2 (UNECE CEFACT Trade Facilitation Recommendation No. 28 edition 2007)



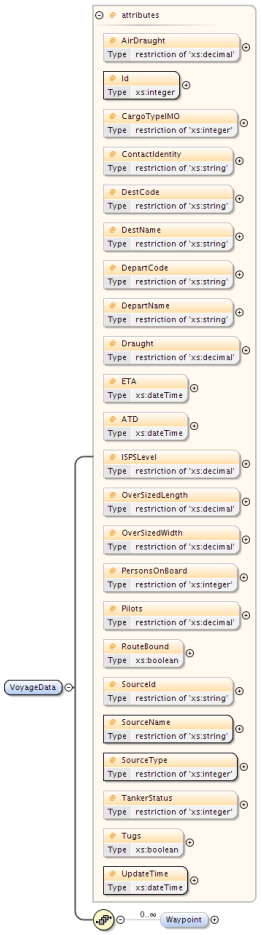
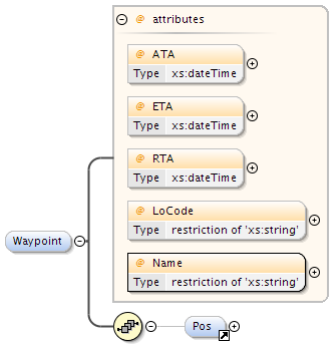
The *Identifier* element consists of the physical construction data of the object (usually a vessel) and the elements *OtherId* and *OtherName.*

The *OtherId* element can consist of Id's for the track which are other than the world wide international standard identifiers, e.g. regional identifiers like ENI.

The *OtherName* element can consist of names for the track which are other than the English name.

### 4.2.4 VoyageData element

The *VoyageData* element consists of the data regarding a movement (voyage) of an object (usually a vessel).

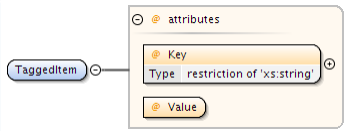


The *VoyageData* element consists of the data on the voyage and can consists of a list of *Waypoint* elements which belong to the voyage*.*

Each *Waypoint* element contains a point in the route of the voyage and contains a *pos* element which defines the exact position of the waypoint*.*

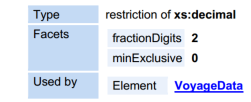
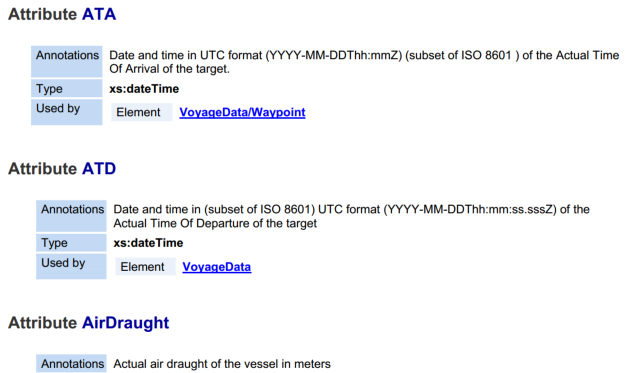
### 4.2.5 TaggedItem element

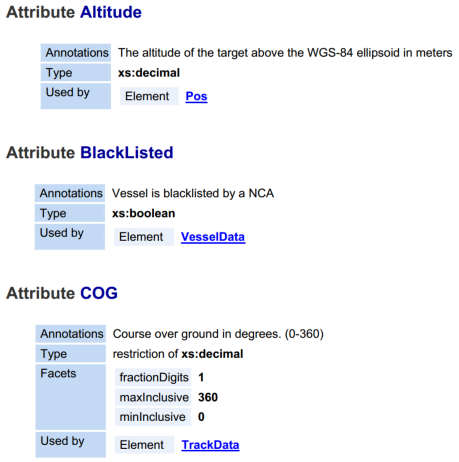
Each *TaggedItem* element consists of a generic key/value pair. A *TaggedItem* element can be used to pass information that is not (yet) in the standard, provided server and user agree upon interface. E.g. Blue sign indication for inland waterways, references to voyage or vessel data (URL) of the data regarding a movement (voyage) of an object (usually a vessel).

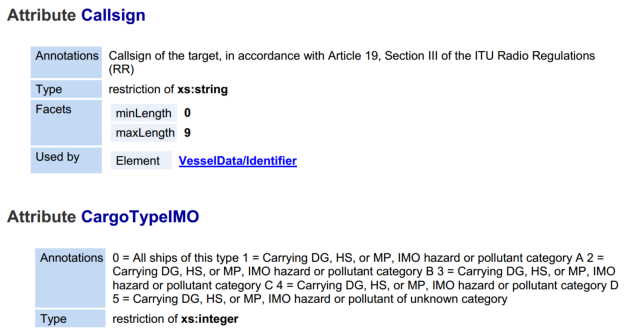


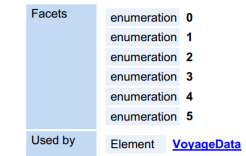
## Feature Catalogue

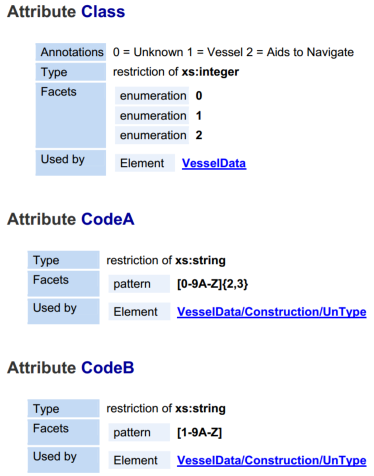
In this section (feature catalogue) each field which can be contained in a VTI messages is described. The attributes used in the *ObjectData* element are listed below.

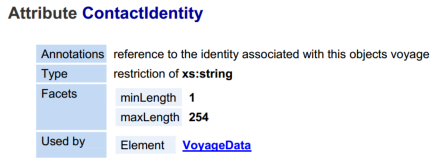


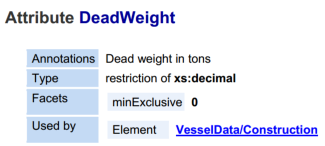


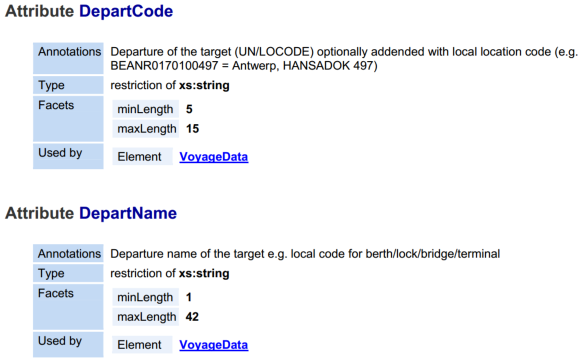




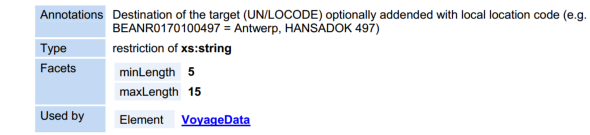


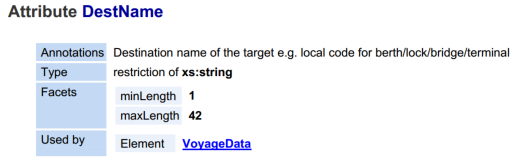


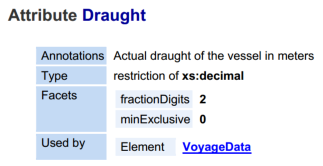


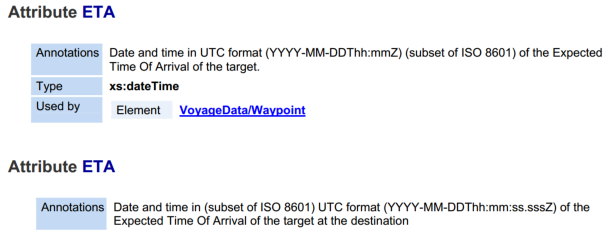


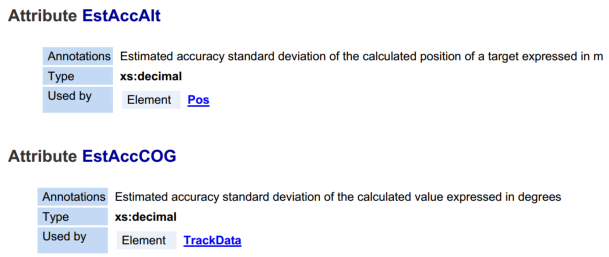


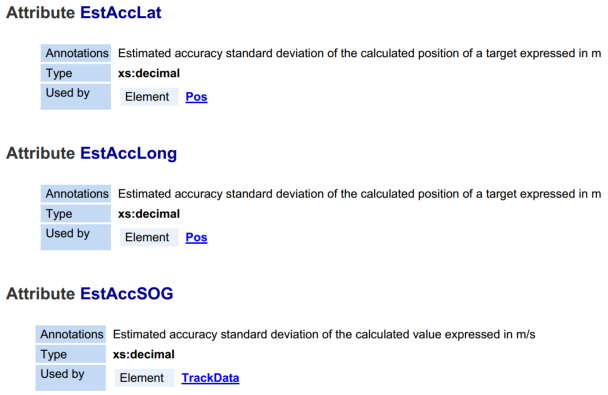


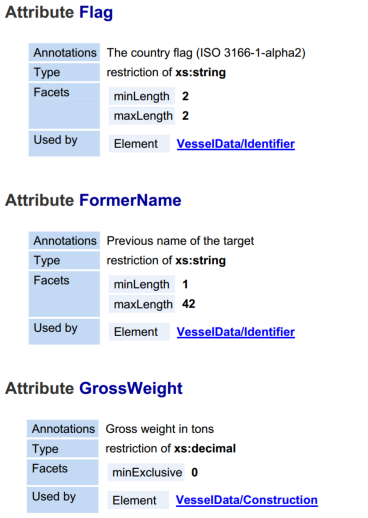


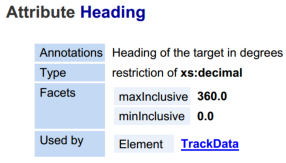


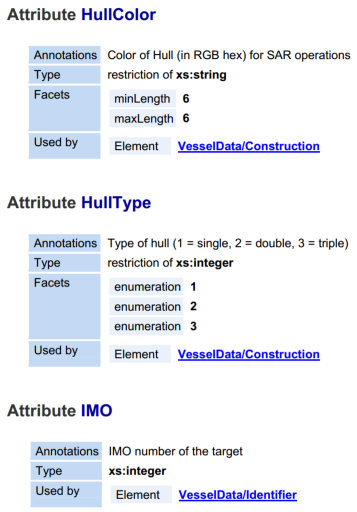


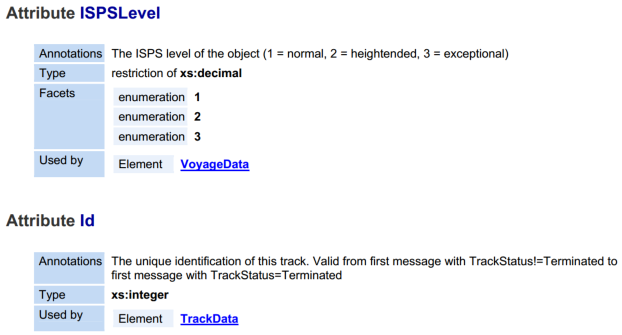






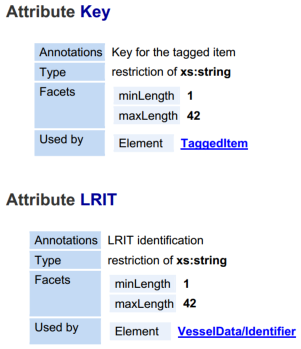


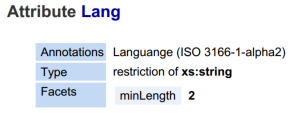




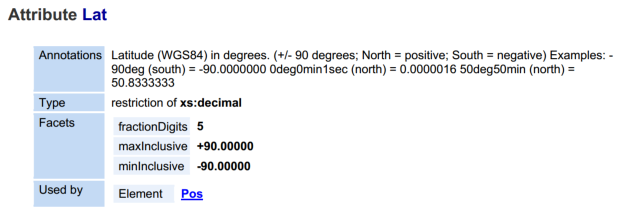


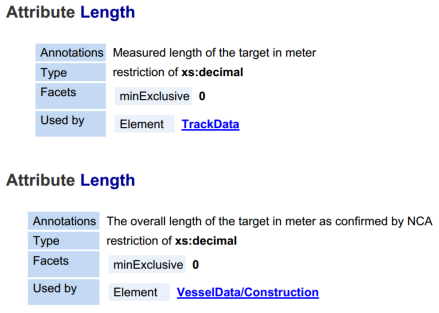


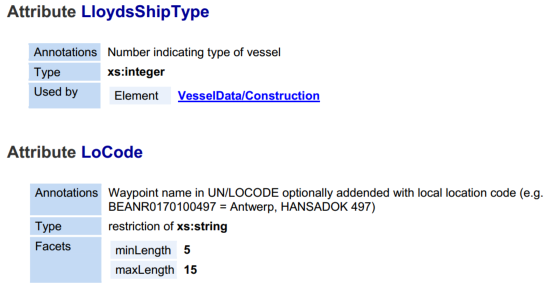


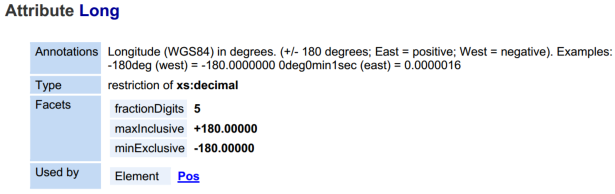


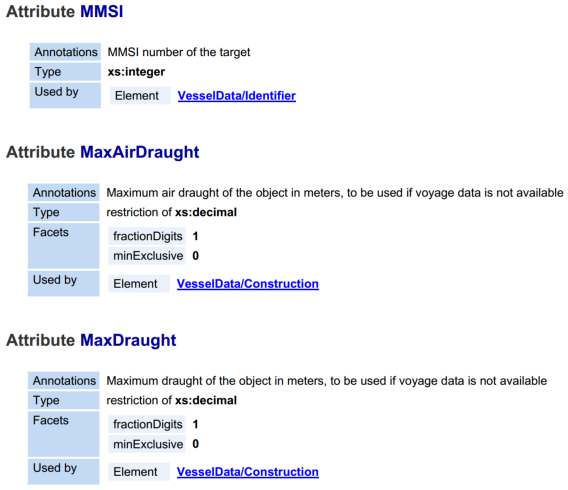


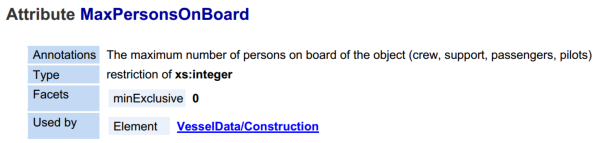


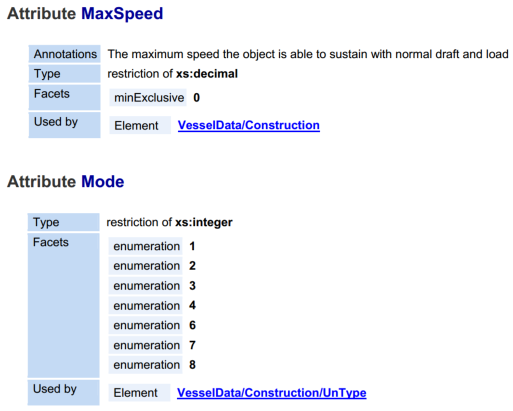


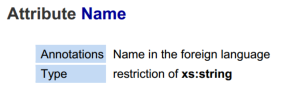


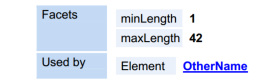


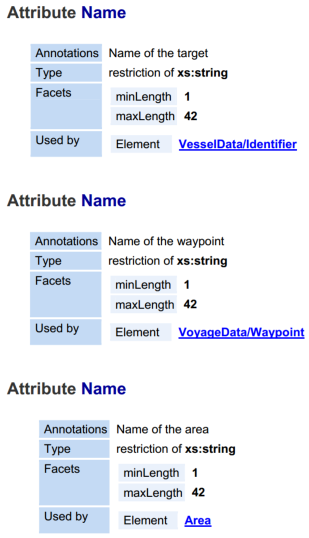


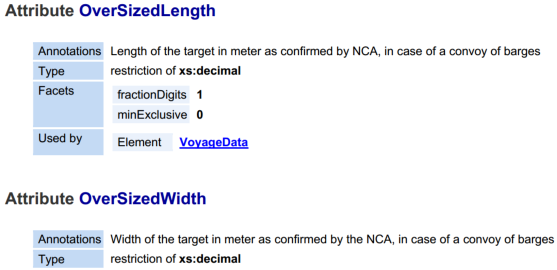


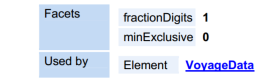


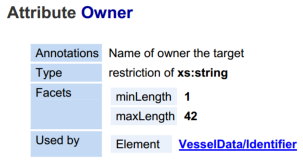


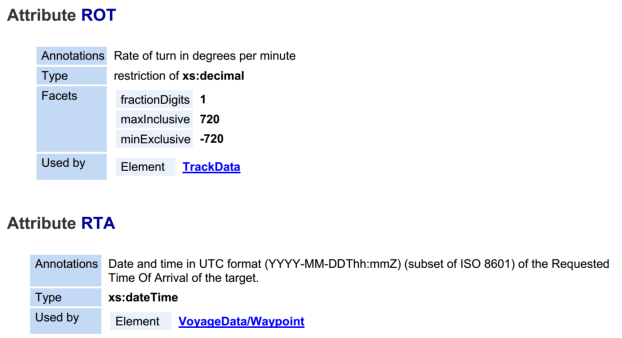
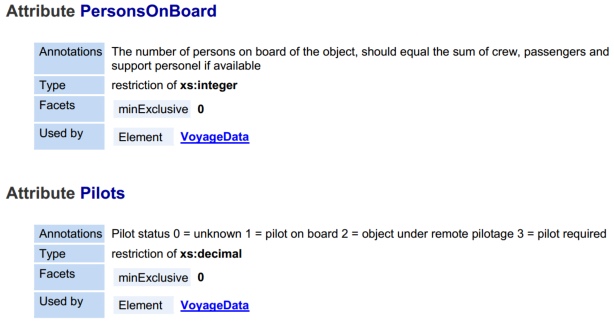


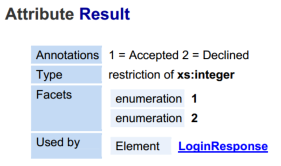


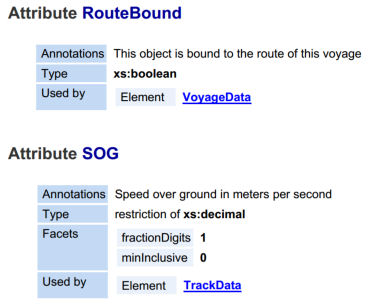


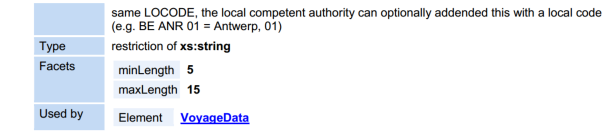


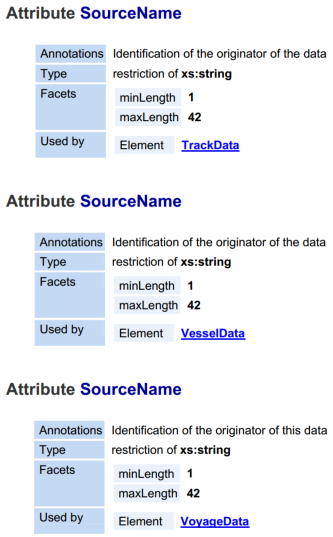


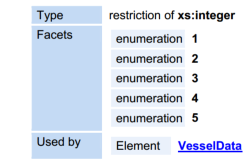
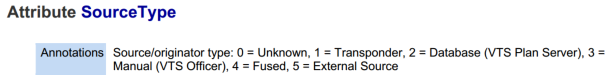




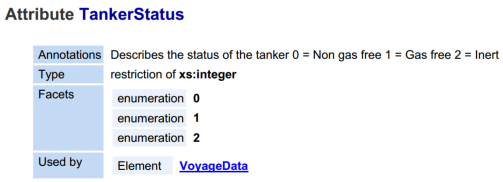


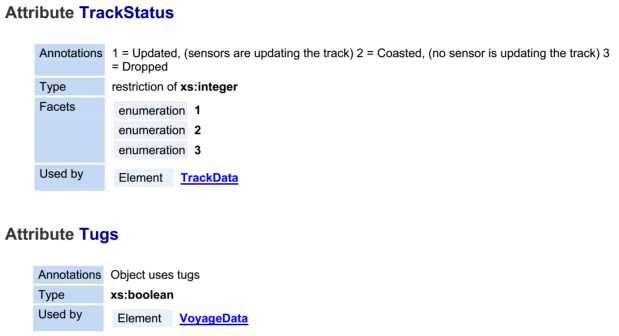


****

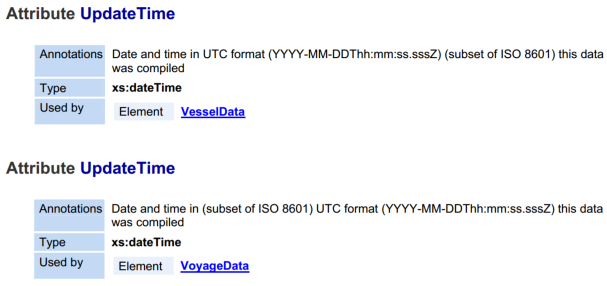
****

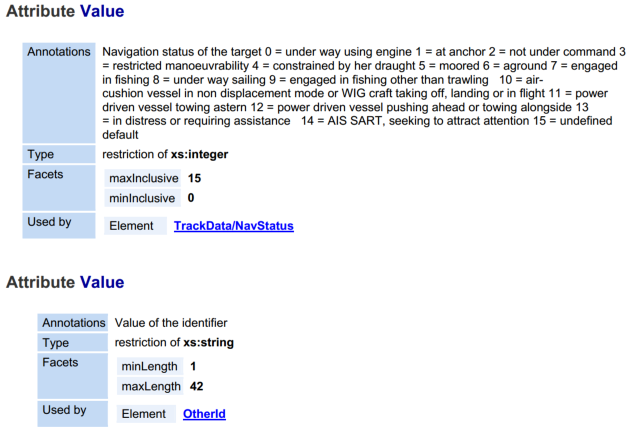
****

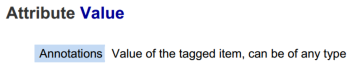
****

****

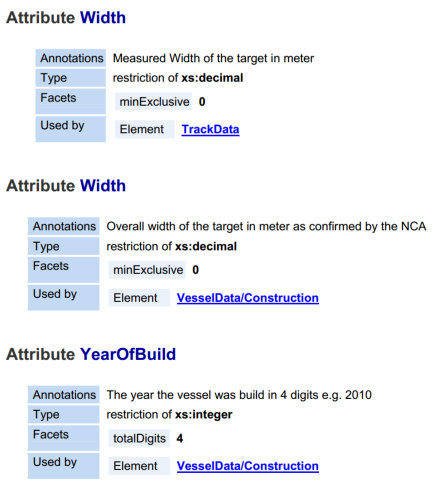
****

****

****

****

****

****

## Data Product Types

NOT APPLICABLE.

## Data Product Loading and Unloading

NOT APPLICABLE.

## Geometry

NOT APPLICABLE

# 5 COORDINATE REFERENCE SYSTEMS (CRS)

## Introduction

IVEF specifies WGS-84 as Coordinate Reference Systems.

# 6 DATA QUALITY

Data quality can be described on three levels for IVEF specification: Service level, dataset level and message level.

## 6.1 Data quality at service level

IVEF supports a service which provides server status data. See Annex F Data service/system specification for the specification of that service and how to retrieve the quality data as described below.

The following fields on service quality can be retrieved from an IVEF service.

|  |  |  |
| --- | --- | --- |
| **Element** | **Field name** | **Description** |
| ServerStatus | Status | Whether or not the service is working correctly.  A ServerStatus is sent with a fixed interval to the users. |
| ServerStatus | ContactIdentity | Reference to the identity associated with this service.  In case a user wants to know who to contact in case the user wants to know more on the service status. |
| Pong | TimeStamp | Date and time this pong message is sent. The time between sending the ping message and the timestamp in the pong message gives an indication of the response time of the service.  In case no pong message is received at all, this can mean the service is not available/is down. |

## 6.2 Data quality at dataset level

Each provider (VTS centre) which provides IVEF services, should provide the following metadata:

* Domain of Interest (DoI): Geographical area which is of interest to a VTS centre.
* Domain of Responsibility (DoR): Area for which the VTS centre is mandated to provide their VTS service.
* Domain of Coorperation (DoC): Overlapping area of two DoI of two VTS centres. The data will be (weighted) averaged -> agreement between VTS centres on QoS.

Quality of Service:

* Availability and timeliness of the IVEF Service
* Emergency/breakdown procedure, if applicable
* Integrity of VTS data (concerns possible filtering of the data)
* The Common Authority, if applicable

Contact a specific VTS centre if you want to know the above data.

In chapter 12, the metadata on the Vessel Traffic Image dataset can be found.

## 6.3 Data quality at message level

IVEF services sends Vessel Traffic Information data to users, using messages. In these messages, metadata is included on the quality of the position data and track data.

*ObjectData* contains the following metadata fields:

|  |  |  |
| --- | --- | --- |
| **Element** | **Field name** | **Description** |
| VoyageData | ContactIdentity | Reference to the identity associated with the voyage.  In case one wants to know more on the voyage. |
| VoyageData | UpdateTime | Date and time the voyage data was compiled. |
| TrackData | EstAccCOG | Estimated accuracy. Standard deviation of the calculated course over ground. |
| TrackData | TrackStatus | Whether the track is still updated. |
| TrackData | UpdateTime | Date and time the track data was compiled. |
| Pos | EstAccAlt | Estimated accuracy. Standard deviation of the calculated altitude. |
| Pos | EstAccLat | Estimated accuracy. Standard deviation of the calculated latitude. |
| Pos | EstAccLong | Estimated accuracy. Standard deviation of the calculated longitude. |
| VesselData | UpdateTime | Date and time the vessel data was compiled |

IVEF supports a service which provides Vessel Traffic Image data. See chapter 13 Data service/system specification for the specification of that service and how to retrieve the quality data as described above.

# 7 DATA CAPTURE AND CLASSIFICATION

NOT APPLICABLE

# 8 DATA MAINTENANCE

The data of an IVEF service is continuously updated since it is a live system without historic data.

NOT APPLICABLE.

# 9 PORTRAYAL

IVEF only has positions (points). It does not have symbols, linestyle, color, etc.

NOT APPLICABLE.

# 10 DATA PRODUCT FORMAT (ENCODING)

## Introduction

Services level: At service level, there are no data products. NOT APPLICABLE

Dataset level : At dataset level, no data is exchanged / retrievable. NOT APPLICABLE

Message level:

|  |  |
| --- | --- |
| Format Name | XML |
| Version | 1.0 |
| Character Set | UTF-8 |
| Specification | XML according to IVEF exchange format (see [XSD of IVEF]) |

# 11 DATA PRODUCT DELIVERY

## Dataset

IVEF delivers in intersections of the Vessel Traffic Image data which is available at the IVEF service. IVEF uses messages to deliver updates of the (continuously changing) data.

Delivery method of the data is over TCP/IP. The format of the files is XML.

### 11.1.1 Datasets

IVEF is message based. In this chapter we describe the delivery of a message instead of a dataset.

### 11.1.2 Dataset size

The specification of IVEF does not restrict the number of *ObjectData elements* in a message. A system which produces/reads IVEF data should define the maximum.

### 11.1.2 Dataset file naming

The specification of IVEF does not specify what filename should be used.

## Support Files

NONE.

## Exchange Catalogue

Only intersections of the current Vessel Traffic Image data can be delivered to the users who have requested the data. IVEF does not provide historic data for exchange.

The IVEF service itself is the exchange service of Vessel Traffic Image data, which is described in this document.

NOT APPLICABLE.

# 12 METADATA

In the table below, the metadata on dataset levels of IVEF is described.

The IVEF dataset is described as the follows: The Vessel Traffic Image data which is available at the IVEF service. This is an ever changing (continuously updated) "dataset". Users get updates via messages when the dataset is updated or can request a snapshot (of an intersection) of the dataset at that moment.

| **Element name** | **Data** |
| --- | --- |
| **MD\_Metadata** |  |
| **MD\_Metadata**.fileIdentifier  (mandatory in S100) | <TBD by IALA> |
| **MD\_Metadata**.language | EN |
| **MD\_Metadata**.characterSet | UTF-8 |
| **MD\_Metadata**.parentIdentifier | - |
| **MD\_Metadata**.hierarchyLevel | Dataset |
| **MD\_Metadata**.hierarchyLevelName | Dataset |
| **MD\_Metadata**.contact >  CI\_ResponsibleParty.individualName | IALA |
| **MD\_Metadata**.contact >  CI\_ResponsibleParty.organisationName | - |
| **MD\_Metadata**.contact >  CI\_ResponsibleParty.positionName | - |
| **MD\_Metadata**.contact >  CI\_ResponsibleParty.role >  CI\_RoleCode | pointOfContact |
| **MD\_Metadata**.dateStamp | <date of creation dataset metadata> |
| **MD\_Metadata**.metadataStandardName (geographic dataset) | ISO 19115 |
| **MD\_Metadata**.metadataStandardVersion (geographic dataset) | ISO 19115 |
| MD\_Metadata.identificationInfo > **MD\_DataIdentification**.citation >  CI\_Citation.title | ? |
| MD\_Metadata.identificationInfo > **MD\_DataIdentification**.citation >  CI\_Citation.date >  CI\_Date.dateType >  CI\_DateTypeCode | creation/ revision/ publication |
| MD\_Metadata.identicationInfo > **MD\_DataIdentification**.abstract | <abstract on the vessel traffic image data of IVEF> |
| MD\_Metadata.identificationInfo > **MD\_DataIdentification**.pointOfContact > CI\_ResponsibleParty  (geographic dataset) | <List of VTS centres and Common Authorities> |
| MD\_Metadata.identificationInfo > **MD\_DataIdentification**.spatialRepresentationType  (geographic dataset) | Vector |
| MD\_Metadata.identificationInfo > **MD\_DataIdentification**.spatialResolution >  MD\_Resolution.distance or  MD\_Resolution.equivalentScale  (geographic dataset) | Distance meter 0.01 |
| MD\_Metadata.identicationInfo > **MD\_DataIdentification**.language | English |
| MD\_Metadata.identicationInfo > **MD\_DataIdentification**.characterSet | UTF-8 |
| MD\_Metadata.identicationInfo > **MD\_DataIdentification**.topicCategory | Transportation |
| MD\_Metadata.identicationInfo > MD\_DataIdentification.extent >  **EX\_Extent** >  EX\_GeographicBoundingBox or EX\_GeographicDescription  (geographic dataset) | Global |
| MD\_Metadata.identicationInfo > MD\_DataIdentification.extent >  **EX\_Extent**.verticalElement >  EX\_VerticalExtent  (geographic dataset) | IVEF does not have restrictions on verticalExtent  N.A. |
| MD\_Metadata.identicationInfo > MD\_DataIdentification.extent >  **EX\_Extent** > EX\_GeographicDescription.geographicIdentifier | Global |
| MD\_Metadata.dataQualityInfo >  **MD\_ReferenceSystem**.referenceSystemIdentifier >  RS\_Identifier  (geographic dataset) | EPSG:4326 / WGS 84 |
| MD\_Metadata.distributionInfo >  **MD\_Distribution** >  MD\_Format  (geographic dataset) | XML |
| MD\_Metadata.distributionInfo >  **MD\_Distribution** >  MD\_DigitalTransferOption.onLine >  CI\_OnlineResource  (geographic dataset) | <url to webpage where to subscribe to Vessel Traffic Image data> |

# 13 Data service/system specification

See ANNEX F Data service/system specification.

# ANNEX F DATA SERVICE/SYSTEM SPECIFICATION

# 1 PRODUCT

## 1.1 FUNCTIONAL SUITABILITY

### 1.1.1 Functional completeness

### 1.1.2 Functional correctness

### 1.1.3 Functional appropriateness

## 1.2 PERFORMANCE EFFICIENCY

### 1.2.1 Time-behavior

### 1.2.2 Resource utilization

### 1.2.3 Capacity

## 1.3 COMPATIBILITY

### 1.3.1 Co-existence

### 1.3.2 Interoperability

## 1.4 USABILITY

### 1.4.1 Appropriateness recognisability

### 1.4.2 Learnability

### 1.4.3 Operability

### 1.4.3 User error protection

### 1.4.4 User interface aesthetics

### 1.4.5 Accessibility

## 1.5 RELIABILITY

### 1.5.1 Maturity

### 1.5.2 Availability

### 1.5.3 Fault tolerance

### 1.5.4 Recoverability

## 1.6 SECURITY

### 1.6.1 Confidentiality

### 1.6.2 Integrity

### 1.6.3 Non-repudiation

### 1.6.4 Accountability

### 1.6.6 Authenticity

## 1.7 MAINTAINABILITY

### 1.7.1 Modularity

### 1.7.2 Reusability

### 1.7.3 Analyzability

### 1.7.4 Modifiability

### 1.7.5 Testability

## 1.8 PORTABILITY

### 1.8.1 Adaptability

### 1.8.2 Installability

### 1.8.3 Replaceability

# 2 USAGE

## 2.1 EFFECTIVENESS

## 2.2 EFFICIENCY

## 2.3 SATISFACTION

### 2.3.1 Usefulness

### 2.3.2 Trust

### 2.3.3 Pleasure

### 2.3.4 Comfort

## 2.4 FREEDOM FROM RISK

### 2.4.1 Economic risk mitigation

### 2.4.2 Health and safety risk mitigation

### 2.4.3 Environmental risk mitigation

## 2.5 CONTEXT COVERAGE

### 2.5.1 Context completeness

### 2.5.2 Flexibility