Change proposal S-100 Annex C

Exercise output documents

C62-11.4.6.4

S-100 for the Inter-VTS Exchange Format Service

(S-100 for the IVEF service)

Gap Analysis between S-100 and IVEF

04 January 2015, Author Approved

Contents

1 OVERVIEW

1.1 Introduction

The reason for this Gap Analysis document is the analysis in [S-100 extension for streaming data service] in which is concluded the S-100 framework in its current form, does not provide support for streaming data services. But streaming data services are envisioned to be formed in various e-Navigation Maritime Service Portfolios.

To specify what exactly is needed in the S-100 framework to fit the needs of streaming data services, one of the streaming data services has been selected to make a "Gap Analysis" of, as a case study. The IVEF services (Intersystem Vessel traffic image Exchange Format services) has been picked for this purpose. The result of the case study has been put into this document.

1.2 References

1.2.1 Normative references

[IVEF]	IALA Recommendation V-145 on the Inter-VTS Exchange Format Service Edition 1 June 2011
[S-100]	S-100 IHO Universal Hydrographic Data Model Edition 2.0.0 June 2015
[IALA S-100]	IALA Guideline No. 1106 on Producing an IALA S100 Product Specification Edition 1 December 2013

1.2.2 Informative references

[S-100 extension for streaming data service]	ENAV17-9.9 On extending the S-100 framework for streaming data services. Author Eivind Mong. Version: Draft 4

1.3 Terms, definitions and abbreviations

1.3.1 Terms and Definitions

Vessel Traffic Image	The consolidated information about vessels and their movements in a particular area of interest.
Service (IVEF)	A service is a collection of functionality which is served to its users. Users only have to know what functionality is offered and how they can make

	use of the services. In this document we use "IVEF service/system", as the IVEF specification contains service as well as system specifications.
Software (IVEF)	Software and system are sometimes used for the same thing. Usually when we consider software, the scope is somewhat more narrow than when considering systems (for example when talking about network protocols and hardware, it is no longer software). In this document we use the term system for IVEF rather than software.
System (IVEF)	A system is the collection of software which together provide certain functionality (can be described in services), but also includes aspects on maintenance, modularity, efficiency, security, reliability, etc. These are not directly functionalities to users. Requirements on systems contain a part which describe functionalities and a part which describe non-functionalities, also called quality requirements. In this document we use "IVEF service/system", as the IVEF specification contains service as well as system specifications.

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
IVEF	Intersystem Vessel traffic image Exchange Format
VTI	Vessel Traffic Image
VTS	Vessel Traffic Service
XML	eXtensible Markup Language

2 GAP GLANCE

A first look at [IVEF] and the [S-100] documents and their (mis)match.

2.1 IVEF specification

Long title of IVEF specification: "The Inter-VTS Exchange Format service."

First of all, according to the title, IVEF is a service, for which a specification is written. When looking through the specification in [IVEF] it is clear the specification contains not only requirements (what should it do) but also design (how should it do it). Some parts of the IVEF services are described in detail while other parts are described at high level.

The interaction part, as IVEF describes it, is the part which has been specified in high detail. In the software world, this would be described as an interface design description (description on the external user interface). This part answers the question: "How can my software communicate with yours so I can retrieve the data I want".

So, if a VTS system wants to exchange Vessel Traffic Information by using "IVEF", the software of that party must facilitate the services exactly as described in the specification and fulfill the system requirements and design as described. That way, exchange of VTS information should be possible between VTS providers.

2.2 S-100 specification

Long title of S-100 specification: "S-100 IHO Universal Hydrographic Data Model."

According to the title, S-100 is a standard which supports data. Specifically: contemporary, hydrographic geospatial data. When looking through the specification in [S-100], the standard seems to support "datasets". Dataset in the S-100 context, is a collection/set of data, which is static and whose content can be described by providing metadata on it. Users can look through/browse the metadata of these dataset to see which datasets are interesting for them, and can retrieve the datasets.

After retrieval of the datasets, users can use them for their own purpose. They can plot the data, analyze it, compare the data with other data, use the data in a map, etc.

S-100 focuses on standardization of this data and the standardization of the description of the data. This way, data can be interchanged and mixed more easily.

2.3 Differences and similarities

At a first glance, [IVEF] and [S-100] seem to focus on different aspects of hydrographical data. [IVEF] describes the **mechanism** for exchanging data while [S-100] looks at the **content**. In other words: Service/software standardization versus data standardization.

What the two have in common is they both handle hydrographic data and define standards on the exchange of data. Using standards to facilitate exchange of data is in both standards the main goal.

In the next chapter the differences and similarities are summed. A more detailed comparison can be found in chapter 4.

3 CONCLUSIONS GAP ANALYSIS

To detect the gap, the two standards are compared in two directions: In 3.1 we look at the content (chapters) of [IVEF] and see which parts of the specification we can fit into S-100 and which we cannot. In 3.2 we look at the template [IALA S-100] and see whether we can fill in each chapter decently/usefully.

In chapter 4 comparison given in more detail. In this chapter we give a summary of the comparison.

Below a summary of the parts which are incorporated in the IVEF specification.

- Usage, context, purpose and scope description of the IVEF **service** as a whole.
    - Description of context of IVEF service in e-Navigation (VTS centers and User of authorities)
    - Description of Vessel Traffic Image data exchange service (main IVEF service, client/server model)
- Description of the service models in the individual IVEF **services** (components description, detailed design specification, recommendations)
    - Data Model
        - Description of IVEF service in e-Navigation (as shore-based gateway service)
        - Description of context of IVEF data model in IALA Universal Maritime Data Model (IALA UMDM)
    - Interfacing Model
        - Description of scope of IVEF in OSI model (technical scope)
        - Requirement usage of XML
    - Interaction Model
        - Requirement which parameters can be used in the communication (external user interface)
        - Description scope of IVEF in OSI and recommended layers (TCP/IP, ZLIP)
        - Description of the most common use cases (activity diagrams)
        - Requirements on interaction with IVEF such as login/logout, ping/pong
        - Requirements on features of the service
        - Description on usage, risk and operational characteristics per service (which is given per interface)
        - Requirements on timing and priorities of messages (what to do when resource of software runs out)
    - Security Model
        - Description of scope of security measures covered by IVEF specification
        - Requirements which security measures have to be in place
    - Test Model

        - Requirements on messages and data (well formed and valid).
    - Administration Model
        - Description on which administration tasks could be possible for the service
        - Description on which maintenance tasks could be performed for the service
        - Recommendation on using a GUI.
    - Quality Parameters
        - Description on quality parameters of an IVEF service (Domain of Interest, Domain of Responsibility, Domain of Cooperation) which could be provided.
        - Description of possible additional functionalities which can provide quality information on the services and integrity

3.1 What parts in IVEF do not fit in S-100

It seems to be easier to describe the parts of the IVEF specification which **can** fit into S-100 first, rather than the other way around.

The parts of the IVEF specification which do fit into S-100 would be the specification parts in which the data structure of a message is defined (described as a part in Interaction model - Requirements on interaction with IVEF - Data structure). This part describes the exact format of the data which is interchanged and a description of the meaning of each of the fields in a message. So: Appendix 1 of [IVEF] which contains a description of the elements and attributes, can be converted into the application scheme and feature catalogue according to [S-100].

The other chapters of the IVEF specification define or describe the IVEF system/service. These chapters contain hard requirements or recommendations on IVEF systems or contain a more informative description on the context and scope of an IVEF system. Some requirements and recommendations are highly technical and on a very low level (detailed design) such as the parts on the OSI model and network. These would belong in a context description of a system.

Use cases describe functionality such as log in, log out, administration, are all functionalities which are not part of data, but part of a system/service. These functionality are for security purpose, maintenance etc and has nothing to do with the content of the (Vessel Traffic Image) data.

Other parts define requirements on the system/service such as the interaction in the interaction model part. These would be interface requirements. These parts describe what protocol you have to use in order to retrieve the data.

All these sections which describe the system/services would fit into a system specification (how should my IVEF system behave and work in order to serve as a compliant IVEF service), but not a data specification.

3.2 What parts in S-100 do not suit IVEF

While datasets as described in S-100 (and ISO 19115) are datasets containing "historic" and "static" data, the IVEF services only know live, continuous changing data. Historic data of the Vessel Traffic Image data are not part of the IVEF specification, only the distribution of the live data is relevant. This has

consequences on how the metadata should be filled, since the current metadata description seem to be made to describe static datasets.

IVEF currently has (meta)data on different "levels".

1. (Meta)data on service level. This data tells something about the availability of the main IVEF service. This data is also live data as it adapts itself to reflect the current situation on an IVEF system. This data is send periodically or on request by an IVEF system/service. Since it is data on the (availability of the) Vessel Traffic Image data on an IVEF system/service, it could be called metadata.

2. (Meta)data on message level. A message contains data and metadata. The metadata tells who is the source of the message and how accurate certain values in the message are.

3. (Meta)data on dataset level. IVEF currently does not has (meta)data on "dataset" level as S-100/ISO 19115 describes it, but with a slight different interpretation of a dataset, it is possible to provide metadata at this level. An IVEF dataset we describe as the "Vessel Traffic Image" which exists at the IVEF service. Since this data is changing continuously, this dataset is thus a continuously changing dataset instead of a static dataset.

With these three levels of IVEF, we took the sections of [IALA S-100] and checked if we could fill in the section with useful information from [IVEF]. It seems that per section, it can differ which level we should take to fill in the information.

It seems most chapters can be filled with [IVEF] data, but sometimes only if we make concessions or use a slightly different interpretation of the description (such as for dataset).

Most notable would be the metadata. The metadata on service and message level for example, are interwoven in the messages. This metadata is not static data but live data, as of all the rest of IVEF. This live part of the metadata cannot be put in a static metadata description (ISO 19115). More suitable would be a description of the metadata fields and where to find it instead of putting in the metadata itself. Static metadata such a "point of contact" and coordinate reference system **can** be put into ISO 19115 format.

3.3 Overall conclusion

It seems there are two main challenges in fitting the IVEF services specification into the S-100 framework:

1. IVEF is a service and the IVEF specification is therefore a description of the system/service. S-100 framework on the other hand is made to describe data. System/service versus data. As the most part of [IVEF] are descriptions of the system/service and not a description of its dataset content. These parts currently cannot fit into [IALA S-100]. The only part which could fit into [IALA S-100] is the Data structure description of the messages (Appendix 1 of [IVEF]).

2. The data which is exchanged in IVEF format and which lives at the IVEF services is "live data". IVEF does not provide data which is "historic" or in the past. S-100 on the other hand, is made to describe a dataset, static data. By dividing the IVEF data in three levels, most of the sections of [IALA S-100] can be filled in (by checking which level of IVEF is relevant for that section. A slight redefinition of "dataset" seems to be necessary to be able to describe the Vessel Traffic Image data of IVEF.

   Static metadata such as "point of contact", can be provided in ISO 19115 format. But the live metadata of IVEF on message and service levels cannot be put into S-100/ISO 19115 directly since this data is continuously changing (as of the rest of IVEF). Even if we manage to map the live metadata to the ISO 19115 metadata format, there would be one metadata file for each message. On message level this would really mean be a lot. What seems to be more sensible is to describe the metadata fields are to be found in the messages.

4 GAP ANALYSE DETAILS

To analyze what problems exactly arise when using the S-100 framework to describe the IVEF services, the information needed for each of the two standards have been compared to each other.

The documents which have been used for this comparison are [IVEF] and [IALA S-100].

4.1 Mapping IVEF to S-100

First a check has been performed to see which sections in [IVEF] can be incorporated in which section in the [IALA S-100]. This has been done for each section in [IVEF]. The result has been put in the table below.

When the information in [IVEF] could not be matched to a section in [IALA S-100], the cell under column S-100 has been colored red.

When only a part of the information in [IVEF] could be matched to sections in [IALA S-100], the cell under column S-100 has been colored orange.

When the information in [IVEF] could be matched to a section in [IALA S-100], the cell under column S-100 has been colored green.

A description of the mismatch/gap is given in column "Gap Analysis" in case the cell has not been colored green.

	IVEF	S-100	Gap
1	1 Introduction	1.1 Introduction	No S100 section on introducing the IVEF service (only introducing of the data)
2	2 The IVEF service as described by other IALA recommendations		No S100 section found for introducing the main IVEF Service "Vessel Traffic

	IVEF	S-100	Gap
			Image Data Exchange Service". There should be a S100 section which describes the usage of services of a product.
3	3 Service Model of the IVEF Service		No S100 section found for description of the main IVEF service "Vessel Traffic Image Data Exchange Service". and how it fits in the e-Navigation. There should be a S100 section which describes within which context a service is to be used. (Context Diagram)
4	3.1 Overview Data Model Interfacing Model Interaction Model Security Model Quality Parameters Test Model Administration Model	Data Model: Can be described in section 4.4 Data Product Types Interfacing Model: Can be described in chapter 10 Data product format (encoding) Interaction Model: Can be described in sections 4 Data Content and Structure 4.1 Introduction 4.2 Application Schema 4.3 Feature Catalogue Security Model: Can be described in chapter 11 Data Product Delivery	Quality Parameters: See point 23. Test Model:

	IVEF	S-100	Gap
			See point 24 Administration Model: See point 25 Stakeholders: No S100 section found for the description of the different types of stakeholders of the service (IVEF user and IVEF Service Administrator). There should be a section in S100 in which the different users/stakeholders of the service are described.
5	3.2 Capabilities of the IVEF Service for the Shore-based e-Navigation System		
6	3.2.1 Introduction		
7	3.2.2 Basic IVEF Services (BIS)		No S100 section found on description of the main Basic IVEF service "Vessel Traffic Image Data Exchange Service". The messages (format) of the services itself can be described in S100 in chapter 4. But the purpose of the IVEF service "Vessel Traffic Image Data Exchange" not. There should be a chapter in which the main IVEF service and it's "subservices" can be described.
8	3.2.3 General Use Cases		No S100 section found on interaction between users and the main IVEF service "Vessel Traffic Image Data Exchange Service".
9	3.3 Data Model of the IVEF Service		See point 11
10	3.3.1 Introduction		See point 11
11	3.3.2 The place of the IVEF Service in the e-Navigation Architecture		Scope and boundaries of system. No S100 section found in which the context of the product is described. IVEF is a part of e-Navigation.

	IVEF	S-100	Gap
			Context diagram. There should be a section in S100 in which the context of the product is described. (in 1.1 Overview - Introduction?)
12	3.4 Interaction Model of the IVEF Services	4.2 Application Schema 4.3 Feature Catalogue	Partly, the description of the messages, can be described in S100 section 4.2 and 4.3. No S100 section found in which the interaction (request response) can be described. There should be a section in S100 in which the interaction (interface) of a user with the IVEV services can be described.
13	3.4.1 Context		No S100 section found in which the product in system context is described. There should be a section in S100 in which is made clear what the scope is of the IVEF service in the complete system. (System context diagram, OSI reference model)
14	3.4.2 Service Negotiation		
15	3.4.2.1 Introduction		No S100 section found in which the interaction (user with the service) can be described. There should be a section in S100 in which the interaction (interface) of a user with the IVEV services can be described.
16	3.4.2.2 Service parameters		No S100 section found in which the interaction (user with the service) can be described. There should be a section in which it is explained how to subscribe to data. In

	IVEF	S-100	Gap
			the current S100 standard there seems to be only fixed datasets which can be retrieved. No choice on filtering. Could be a new section in: 11 Data Product Delivery
17	3.4.2.3 Information flow dynamics	Can be described in sections 4 Data Content and Structure 4.1 Introduction 4.2 Application Schema 4.3 Feature Catalogue	There should be a place to fill in for each message the origination and the destination. Currently there is no possibility to describe interaction or request/response in S100.
18	3.4.2.4 Timing and priorities		These are solutions (how to handle) to establish a reliable system (design on handling reliability requirements). There should be a section in which design constraints can be addressed.
19	3.4.3 Part I: Primary service use cases of the BIS		No S100 section found in which the interaction (user with the service) can be described. There should be a section in which the most important use cases of a IVEF Service can be described.
20	3.4.4 Part II: Secondary service use cases of the BIS		See point 19
21	3.5 Security Model of the IVEF Service		No S100 section found in which security of a service can be described. There should be a section in which the security design of the IVEF service can be described.
22	3.6 Interfacing Model of the IVEF Service		No S100 section found in which the place of the IVEF service in the OSI Reference Model can be described. There should be a section in which the

	IVEF	S-100	Gap
			context and scope of the IVEF service can be described.
23	3.7 Quality Parameters of the IVEF Service		No S100 section found for description of the quality of a service. In S100 there is only a chapter on quality of the Vessel Traffic Image Data. The quality parameter of a IVEF Service differs per IVEF Service implementation. Nor in the S100 framework nor in IVEF specification these quality parameters can be given. The fields which are expected to be filled in per IVEF Service provider, can be described. Description if it is a realtime service, near-realtime, non-realtime for example.
24	3.8 Test model of the IVEF Service		No S100 section found for the description of a test service. There should be a section in S100 in which services and it's interfaces can be described.
25	3.8.1 Well formed messages		See point 24
26	3.8.2 Valid message		See point 24
27	3.8.3 Valid data		See point 24
28	3.8.4 Interaction behavior		No S100 section found in which the interaction (user with the service) can be described. There should be a section in S100 in which the interaction (interface) of a user with the IVEV services can be described.
29	3.9 Administration Model of the IVEF Service		No S100 section found for the description of the technical administration aspects / maintenance of

	IVEF	S-100	Gap
			a service. (Only a section on maintenance of (meta) data). There should be a section in S100 in which the administration service can be described.

4.2 Filling S-100 with IVEF service data

In this section a check has been performed whether a section in [IALA S-100], can be filled with data from [IVEF].

When [IVEF] cannot be used to fill in a section in [IALA S-100], the cell under IVEF has been colored red.

When [IVEF] can only partly fill in a section in [IALA S-100], the cell under IVEF has been colored orange.

When [IVEF] can fill in a section in [IALA S-100], the cell under IVEF has been colored green.

A description of the mismatch/gap is given in column "Gap Analysis" in case the cell has not been colored green.

	S100	IVEF service	Gap
1	1 Overview	Take over the references, definitions, abbreviations described in IVEF and fill in who maintains the IVEF-S100 document.	-
2	2 Specification Scopes	IVEF service has (meta) data description on service level (the services and their interface), on dataset level (Vessel Traffic Information) and on message level (Per message).	Although the data of services, dataset and message can be described in this section, the interaction should be added for a complete understanding of the IVEF services.
3	3 Data Product Identification	On dataset level (Vessel Traffic Information), this chapter can be filled.	-
4	4 Data Content and Structure	Description on message level	-
5	4.1 Introduction	Description on message level	-
6	4.2 Application Schema	Appendix 1 - 1 Element Definitions This is a description on message level.	-
7	4.3 Feature Catalogue	Appendix 1 - 2 Attribute Definitions This is a description on message level.	-
8	5 Co-ordinate Reference Systems	IVEF uses WGS84	

	S100	IVEF service	Gap
9	6 Data Quality	Message level: IVEF data contains fields in the messages which contain information of accuracy.	Service level: With IVEF functionality a user can check the service status. But this is not "Data Quality" but rather "Service Quality". Dataset level (Vessel Traffic Information data): Per VTS provider this data should be available. In on IVEF specification level this is not specified (and cannot be specified).
10	7 Data Capture and Classification	-	-
11	8 Data Maintenance	-	-
12	9 Portrayal	-	-
13	10 Data Product Format	The data which is exchanged according to IVEF specification is in XML. The schema definition of the XML is described in: Appendix 1 Data Definition. (See also point 6 and 7).	-
14	11 Data Product Delivery	Data is delivered to subscribers of the data. Description of the services and the interaction. 3.4 Interaction Model of the IVEF Service	-
15	12 Metadata	IVEF service has metadata description on service level (the services and their interface), on dataset level (Vessel Traffic Information) and on message level. The minimal metadata set can be filled in for each of these levels (with redefinition of dataset). If a field is not applicable for that level will be stated as such. But it seems the static metadata on all three	Metadata which are provided by IVEF in the messages, cannot be mapped to the metadata in ISO 19115. On message level, IVEF has metadata such as "estimated accuracy" and "standard deviation of the calculated position". Metadata on message and service level are "live"

	S100	IVEF service	Gap
		levels are quite similar. Metadata on dataset level seems to fit best.	metadata. This metadata is provided inside the messages by IVEF. This would mean one metadata file per message if one would provide only metadata.

C62-11.4.6.4

S-100 for the Inter-VTS Exchange Format Service

(S-100 for the IVEF service)

Recommendation on closing the gap between S-100 and IVEF

04 January 2016, Author Approved

Contents

1 OVERVIEW

1.1 Introduction

In [GAP ANALYSIS] the similarities and differences between the S-100 framework and the streaming data service IVEF (Intersystem Vessel traffic image Exchange Format) has been set out. IVEF has been selected as use case to see how to make S-100 fit for streaming data services.

In this document a recommendation is given on how to extend the S-100 framework to bridge the gap between S-100 and IVEF.

1.2 References

1.2.1 Normative references

[IVEF]	IALA Recommendation V-145 on the Inter-VTS Exchange Format Service Edition 1 June 2011
[S-100]	S-100 IHO Universal Hydrographic Data Model Edition 2.0.0 June 2015
[IALA S-100]	IALA Guideline No. 1106 on Producing an IALA S100 Product Specification Edition 1 December 2013
[GAP ANALYSIS]	IVEF - S100 Gap Analysis Author: S. Ha Status: Author Approved Date: 04 January 2016

1.2.2 Informative references

[ISO/IEC 25010:2011]	http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=35733
[ISO/IEC 12207:2008]	http://www.iso.org/iso/catalogue_detail?csnumber=43447

1.3 Terms, definitions and abbreviations

1.3.1 Terms and Definitions

J-STD-016	Standard for Information Technology, Software Life Cycle Processes - Software Development. This standard is the demilitarized version of the military standard named MIL-STD-498.
Quality requirements / non-functional	The term "quality requirements" is also used for "non-functional requirement". These quality or non-functional requirements, are requirements which do not

requirements	address a functionality for the user. It addresses requirements on the system which are necessary to support the functionalities. Example quality requirements: requirements on maintainability, requirements on reliability, requirements on timeliness, requirements on testability and requirements on security for example.
Levels (IVEF)	For IVEF data, three levels of data have been defined: • Message level data: Data which is exchanged in messages containing Vessel Traffic Image data. This data contains metadata as well as data. • Dataset level: Vessel Traffic Image data which is available at the IVEF service. This data is exchanged with users, using messages. • Service level data: Data which is exchanged, containing information on the IVEF service.
Service (IVEF)	A service is a collection of functionality which is served to its users. Users only have to know what functionality is offered and how they can make use of the services. In this document we use "IVEF service/system", as the IVEF specification contains service as well as system specifications.
Software (IVEF)	Software and system are sometimes used for the same thing. Usually when we consider software, the scope is somewhat more narrow than when considering systems (for example when talking about network protocols). In this document we use the term system for IVEF rather than software.
System (IVEF)	A system is the collection of software which together provide certain functionality (can be described in services), but also includes aspects on maintenance, modularity, efficiency, security, reliability, etc. These are not directly functionalities to users. Requirements on systems contain a part which describe functionalities and a part which describe non-functionalities, also called quality requirements. In this document we use "IVEF service/system", as the IVEF specification contains service as well as system specifications.
Vessel Traffic Image	The consolidated information about vessels and their movements in a particular area of interest.

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
IVEF	Intersystem Vessel traffic image Exchange Format
VTI	Vessel Traffic Image
VTS	Vessel Traffic Service
XML	eXtensible Markup Language

2 SUMMARY: CLOSING THE GAP BETWEEN S-100 AND IVEF

In [GAP ANALYSIS], two main challenges have been identified, using the S-100 standard to describe the IVEF specification.

1. IVEF standard specifies a service/system, it does not specify datasets.
2. IVEF is all about live data and does not do anything with (static) datasets.

In next two sections a short recommendation is given per issue. In chapter 3, the recommendations (and explanation how we got there) are given in more detail.

2.1 Fitting service/system specification into S-100

Currently in the S-100 framework, there is no room for service/system specifications. If S-100 is intended to contain all information of a product such as IVEF, S-100 should be extended so service/system specifications can be addressed. The system or service which provides the dataset (dataset can already be described in the S-100 framework), can then be part of the S-100 specification too. So not only the description of the data, but also the description of the data provider should fit into the S-100 framework.

This could be achieved by adding an extra chapter/annex to the S-100 framework. A choice would be to use the ISO 25010:2011 standard for this extra chapter/annex. In chapter 3.1, some known standards have been considered for extending the S-100 framework with.

Specific location of the extra chapter/annex in [IALA S-100]: Put the service/system specification into a separate chapter, **Chapter 13: Data service/system specification**. In this chapter the system/service of the provider of the data, can be specified. This chapter 13 would be an optional chapter. The template holding the chapters of ISO 25010 could be added as **Annex F Data service/system specification**. In chapter 13 a reference to Annex F Data service/system specification should be added.

At the end of this document, an example for the Annex F Data service/system specification has been provided.

2.2 Fitting IVEF live (meta)data into S-100

At first the live IVEF data does seem to fit badly into the S-100 framework, especially for metadata. It is quite confusing which fields in S-100 should be filled in and with what data, since IVEF is live system and has different data on different levels.

But by separating the different data levels which are contained in the IVEF services, it seems providing metadata is not that impossible. The following levels have been specified: IVEF message level, IVEF

dataset level, IVEF service level. Most of the mandatory fields of the minimal metadata set can be filled in for the IVEF dataset level, with a slight redefinition of "dataset".

The dataset level 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.

More problematic was the metadata information which are provided by IVEF but do not fit the fields of the ISO 19115 standard. For this metadata, it seems to be better to describe each of the metadata fields in the DATA QUALITY chapter. From there a reference can be made to chapter 13 "Data service/system specification" in which it should be described how to retrieve this metadata.

What to do with metadata per level:

1. On message level the fields containing quality information can be described in chapter 6 "DATA QUALITY" of S-100. This chapter need not to be extended. The description on how to retrieve the fields containing quality data is to be described in chapter 13 "Data service/system specification" (to be added to S-100). With a reference from chapter 6 to the specific parts in chapter 13, a link can be made between the explanation of the data and the description on how to retrieve the data.

2. On dataset level a static metadata document with the minimal fields which have to be filled in can be provided. Chapter 12 can be used for this purpose and need not to be extended. It is recommendable to add a description to chapter 12 which explains the IVEF definition of "dataset" (a live dataset rather than a static dataset).

3. On service level the fields containing quality information can be described in chapter 6 "DATA QUALITY" of S-100. This chapter need not to be extended. The description on how to retrieve the fields containing quality data is to be described in chapter 13 "Data service/system specification" (to be added to S-100). With a reference from chapter 6 to the specific parts in chapter 13, a link can be made

2.3 Overall conclusion

By separation on what and how, it seems we **can** fit IVEF into S-100.

- **What** data do we have (description of metadata fields in chapter 6 and chapter 12)
- **How** we can retrieve the data (chapter 13 Data service/system specification and references to it from chapter 6)

A prerequisite is that the new chapter 13, Data service/system specification **is** added to S-100. What standard is used exactly as a standard for chapter 13 (Annex F) is less important, but as earlier said: ISO 25010 seems to be quite a good fit. See chapter 3.1 for more details on standards which can hold service/system specifications.

3 DETAILED: CLOSING THE GAP BETWEEN S-100 AND IVEF

In [GAP ANALYSIS], two main challenges have been identified fitting IVEF standard into the S-100 standard.

1. IVEF standard specifies a service/system, it does not specify datasets.
2. IVEF is all about live data and does not do anything with (static) datasets.

In the next two sections a detailed recommendation is given per issue.

3.1 Fitting service/system specification into S-100

As stated in [GAP ANALYSIS], the S-100 Product Specification is meant for specifying a data product/dataset while the IVEF specification describes a system/service.

The parts of the IVEF specification which currently cannot be fit into the S-100 standard can be described as service/system specifications. [IVEF] contains interface specification, design aspects of the system and many more other system requirements.

Currently the S-100 specification incorporates the ISO 19100-series, which handle data standards. To be able to address the service/system specifications of IVEF, the S-100 standard should be extended with an annex or a chapter in which service/system specifications can be addressed.

Also noticed in [GAP ANALYSIS], the IVEF specification actually specifies more than services alone, it contains system specifications. So we need a template which can hold the system specifications and service specifications. In the world of Information Technology, a service specification is best described as "interface specification". This interface specification is that part of the system which other systems need to know of in order to communicate with it. An interface specification is often part of a systems specification.

3.1.1 J-STD-016 standard

In the software standard "J-STD-016" (a well-known standard in the Information Technology), interface specifications can be addressed in an "Interface Requirements Specification" document. Other system specifications can be addressed in a document such as the "System/Subsystem Specification". Design aspects can be addressed in a "System/Subsystem Design Description". For each place in the software lifecycle a document is available.

The J-STD-016 standard can be somewhat too large for embedding into the S-100 specification. J-STD-016 has strict separation of specification (requirements), design, interface, user manual, install manual, etc. [IVEF] contains specifications, context designs, detailed designs, interface descriptions and more. In order to specify IVEF properly, we would have to use multiple documents from the J-STD-016 standard.

If, for practical reasons, we would want to fit the service/system part of IVEF into one J-STD-016 document, this could be possible using the Software Requirements Specification (SRS). This document holds the specifications of a system (whose purpose is to serves certain services). For some parts of the IVEF system, a design has been given. These (detailed) designs parts in the IVEF specification would in

that case be design restrictions/design requirements in the specification document. The interface part of IVEF can be put into the interface specification part of the Software Requirements Specification.

The System/Subsystem Design Description (SSDD) would be a candidate too, in holding the service/system part of the IVEF specification. This is a lower level document in the J-STD-016 standard compared to the Software Requirements Specification. In this Design Description document, the subsystems are described together with their interfaces. But this is somewhat too low level for IVEF. In [IVEF], models are described, but these don't have to be actual subsystems (likely it would, but this is not required by the IVEF specification).

Hence the choice for Software Requirements Specification (SRS) in case J-STD-016 standard is to be used for holding IVEF service/system specifications.

3.1.2 ISO standard

ISO/IEC 12207:2008 is the ISO variant of J-STD-016 and is called: "Systems and software engineering - Software life cycle processes". ISO/IEC 12207 describes the system analysis, phase and the systems architectural design phase. In ISO/IEC 12207 it seems the system requirements analysis phase, which results in system requirements specifications, the place where the [IVEF] specification can be placed into.

ISO also defines the ISO 25000 series which is called: "Software engineering - Product quality". ISO/IEC 25010:2011, "System and Software Quality Requirements and Evaluation (SQuaRE)". So which of the ISO standards would fit best? The content of ISO 12207 "Systems Requirements specification" and the ISO 25000 "Systems Quality Requirements" seem to have a lot of overlap.

So we look at the names of the standards: "ISO 12207 system and software engineering - software life cycle" versus "ISO 25010 system quality requirements and evaluation".

- The latter focuses more on the quality (non-functional) requirements (but has space for functional requirements), while the first contains systems requirements (thus functional and quality requirements).
- ISO 12207 is a very extensive standard (just as J-STD-016) where the system requirements are only part of, while ISO 25010 seems to be a standard which can be used by itself.
- The ISO/IEC 25010:2011 seems to be suitable for usage from different perspectives according to its description. Its purpose is also more wide than the document of the J-STD-016 standard, so it gives more space to use it according to our needs (fit in the IVEF specification).

3.1.3 Conclusion & recommendation

If S-100 is intended to contain all information of a product such as IVEF, there should be an extra chapter/annex in S-100 in which the IVEF service/system specifications can be addressed. A choice would be to use the ISO 25010:2011 standard for this chapter/annex. It is possible to use a template from another standard (J-STD-016 or ISO 12207), but those are made to be part of that other standard. The ISO 25010:2011 standard seems not to have that problem and can be used as a separate document/specification standard.

Recommendation: Use ISO 25010 to describe service/system specifications of [IVEF].

The service/system specification should be put in a new chapter in S-100: **Chapter 13: Data service/system specification**. In this chapter, the system/service which provides the described datasets can be specified, according to ISO 25010. This chapter 13 would be an optional chapter. The template holding the chapters of ISO 25010 should be added as **Annex F Data service/system specification** and referred to from chapter 13.

3.2 Fitting IVEF live (meta)data into S-100

Currently the S-100 standard is most suitable in describing (meta)data on dataset level. S-100 does indicate more levels such as series and service, but does not provide details on those levels.

In IVEF there is actually no such thing as a "dataset" such as described in ISO 19115/S-100. The IVEF services deliver pieces of the Vessel Traffic Image data (in a message) to the users who have subscribed to this data. After that, the data is "gone". A user cannot retrieve previous/historic data from an IVEF system.

For IVEF the metadata on three levels is filled at three levels: Message level, dataset level (the Vessel Traffic Image data which is available at an IVEF service) and service level. The IVEF dataset is somewhat different than a classic "dataset" as described in S-100.

The dataset level 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 when the dataset is updated or can request a snapshot (of an intersection) of the dataset at that moment.

3.2.1 IVEF metadata on service level

The service level of IVEF does not say anything on the Vessel Traffic Image data. The metadata is therefore the metadata on the services (software) which provide the data. Most metadata fields seem to be NOT APPLICABLE, so at this level, it seems not very useful to describe the metadata according to ISO 19115.

The IVEF services do provide data which tells something about the services themselves (whether it is available or not and who is the party to contact). It seems more useful to address those fields as metadata of an IVEF service, instead of defining a static metadata document for the service level data. This way, metadata exists per IVEF service, albeit not according to the ISO 19115 standard.

3.2.2 IVEF metadata on dataset level

The metadata of the Vessel Traffic Image data which exists on the IVEF service. At this level, we treat the IVEF dataset as if it was a "classic" dataset. A metadata document according to ISO 19115 standard can be provided at this level.

3.2.3 IVEF metadata on message level

This metadata of the messages. A message contains a part of/an intersection of the Vessel Traffic Image data at that moment. The content of a message is dependent on the query/request of a user. For this level it seems difficult to write down the metadata. Some fields are NOT APPLICABLE or it has the same content as the metadata field on dataset level.

In the messages themselves, metadata on the data in the messages is available. This metadata is should be described in the section "Data Quality". It seems more useful to address those fields as metadata of a message, instead of defining a static metadata document for the message level data. This way, metadata exists per message, albeit not according to the ISO 19115 standard.

3.2.4 Conclusion & recommendation

By a separation of the different data levels which are contained in the IVEF services, it seems like providing metadata is not that impossible, although IVEF is a live service. Most of the mandatory fields of the minimal set can be filled in.

More problematic is the metadata information which are provided by IVEF but cannot be put in ISO 19115 standard. But for this metadata, it is better to describe each field in the DATA QUALITY chapter. A reference can made to chapter 13, Data service/system specification, in which it is described how to retrieve this data.

Recommendations:

1. On message level the fields containing quality information can be described in chapter 6 "DATA QUALITY" of S-100. This chapter need not to be extended. The description on how to retrieve the fields containing quality data is to be described in chapter 13 "Data service/system specification" (to be added to S-100). With a reference from chapter 6 to the specific parts in chapter 13, a link can be made between the explanation of the data and the description on how to retrieve the data.

2. On dataset level a static metadata document with the minimal fields which have to be filled in can be provided. Chapter 12 can be used for this purpose and need not to be extended. It is recommendable to add a description to chapter 12 which explains the IVEF definition of "dataset" (a live dataset rather than a static dataset).

3. On service level the fields containing quality information can be described in chapter 6 "DATA QUALITY" of S-100. This chapter need not to be extended. The description on how to retrieve the fields containing quality data is to be described in chapter 13 "Data service/system specification" (to be added to S-100). With a reference from chapter 6 to the specific parts in chapter 13, a link can be made between the explanation of the data and the description on how to retrieve the data.

ANNEX 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

C62-11.4.6.4

Inter-VTS Exchange Format Service

(IVEF service)

S-100 Product Specification of the IVEF service

04 January 2016, Draft

Contents

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 with 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.

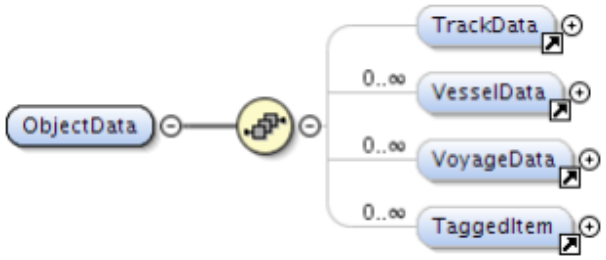
1. By a subscription on updates.
2. By a one-time request with a query.

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

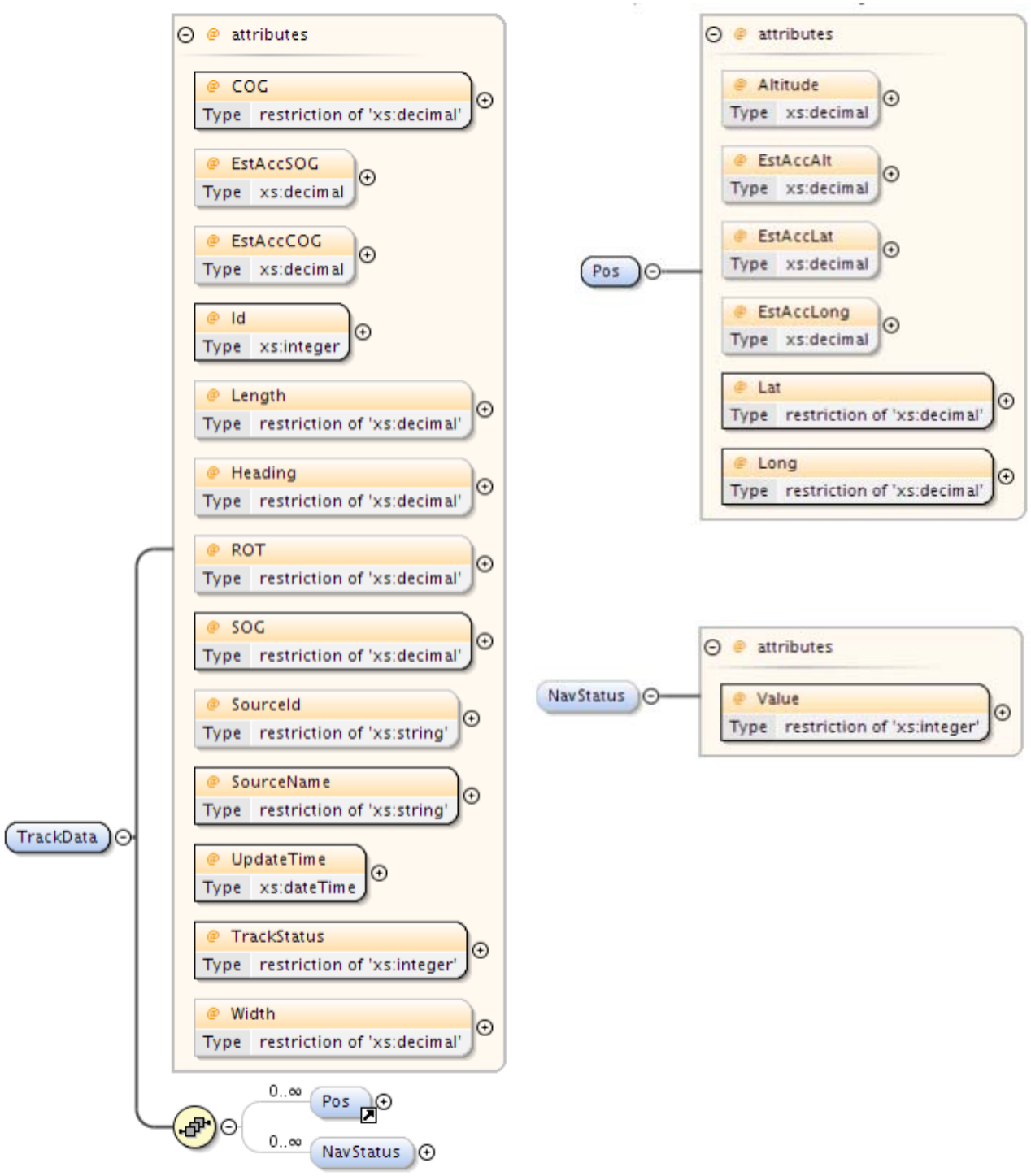
The Vessel Traffic Information consist of multiple *ObjectData* element. The *ObjectData* elements are contained in an element called *ObjectDatas*.



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).



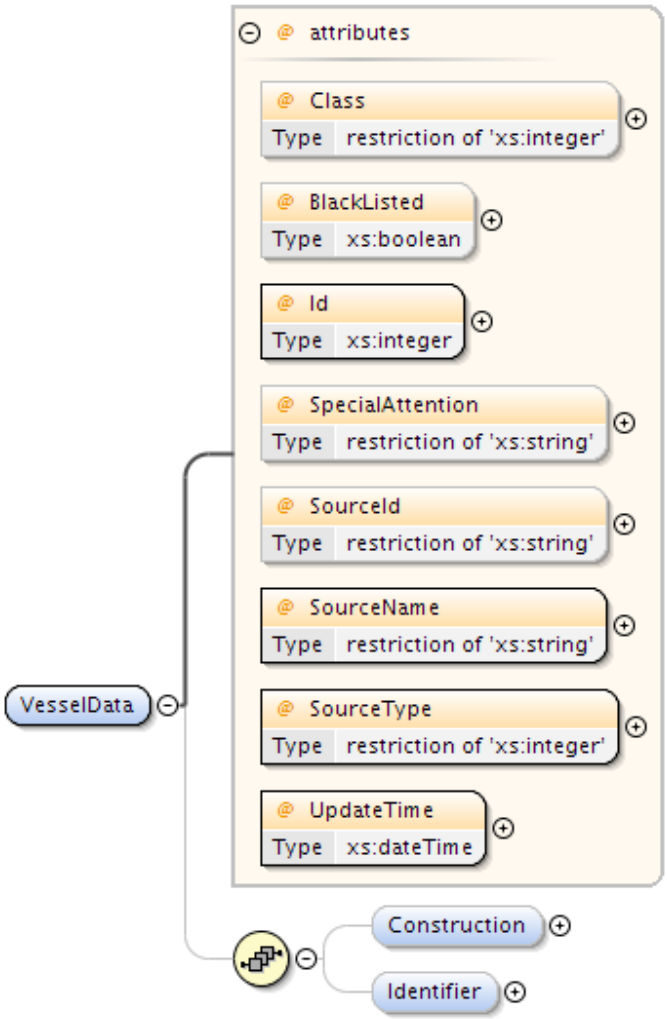
The *TrackData* element consists of the report data of the position of an object as well as a *Pos* element and a *NavStatus* element.

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

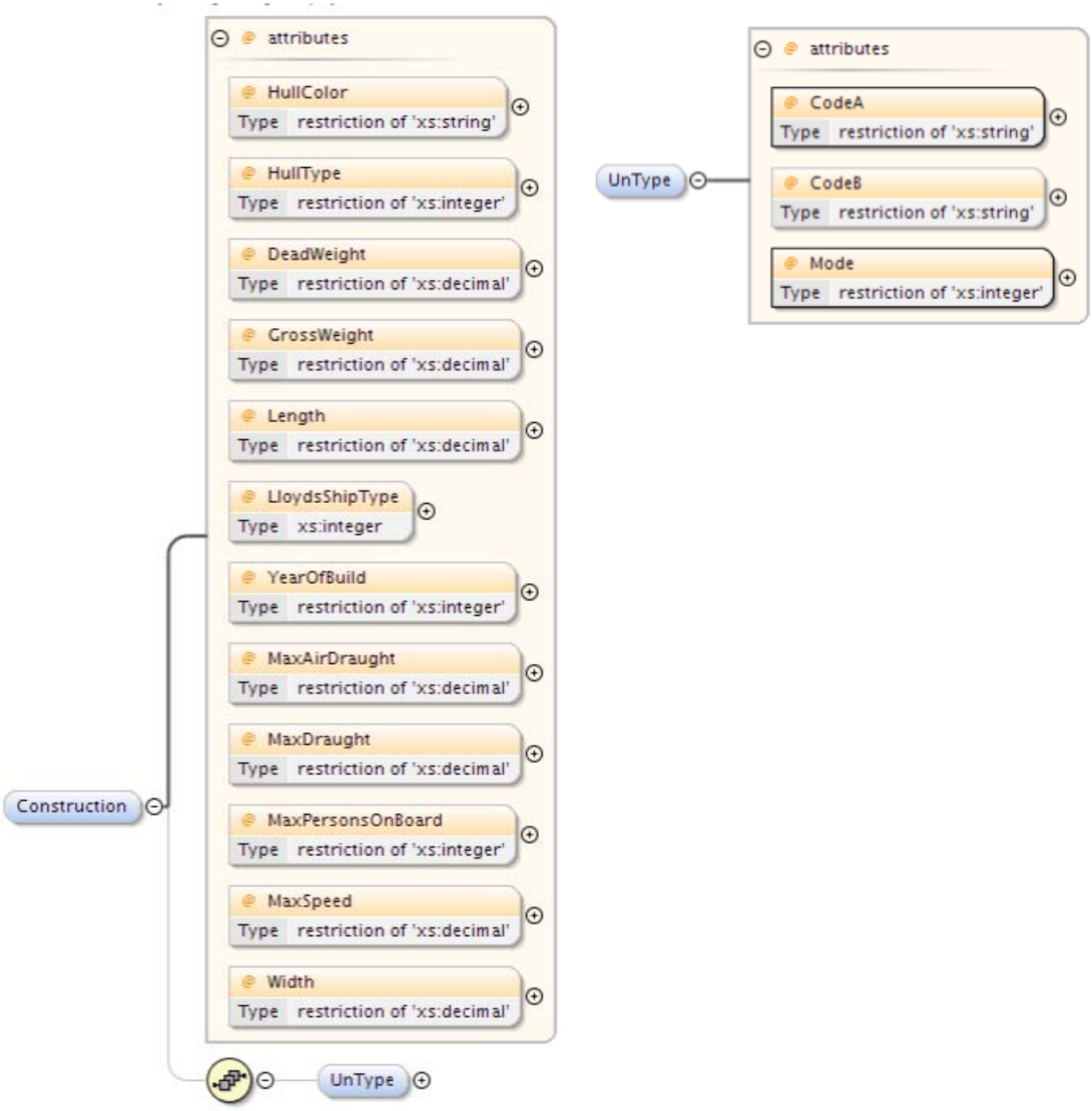
The *NavStatus* element consists of the current status of the voyage the vessel is taking.

4.2.3 VesselData element

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

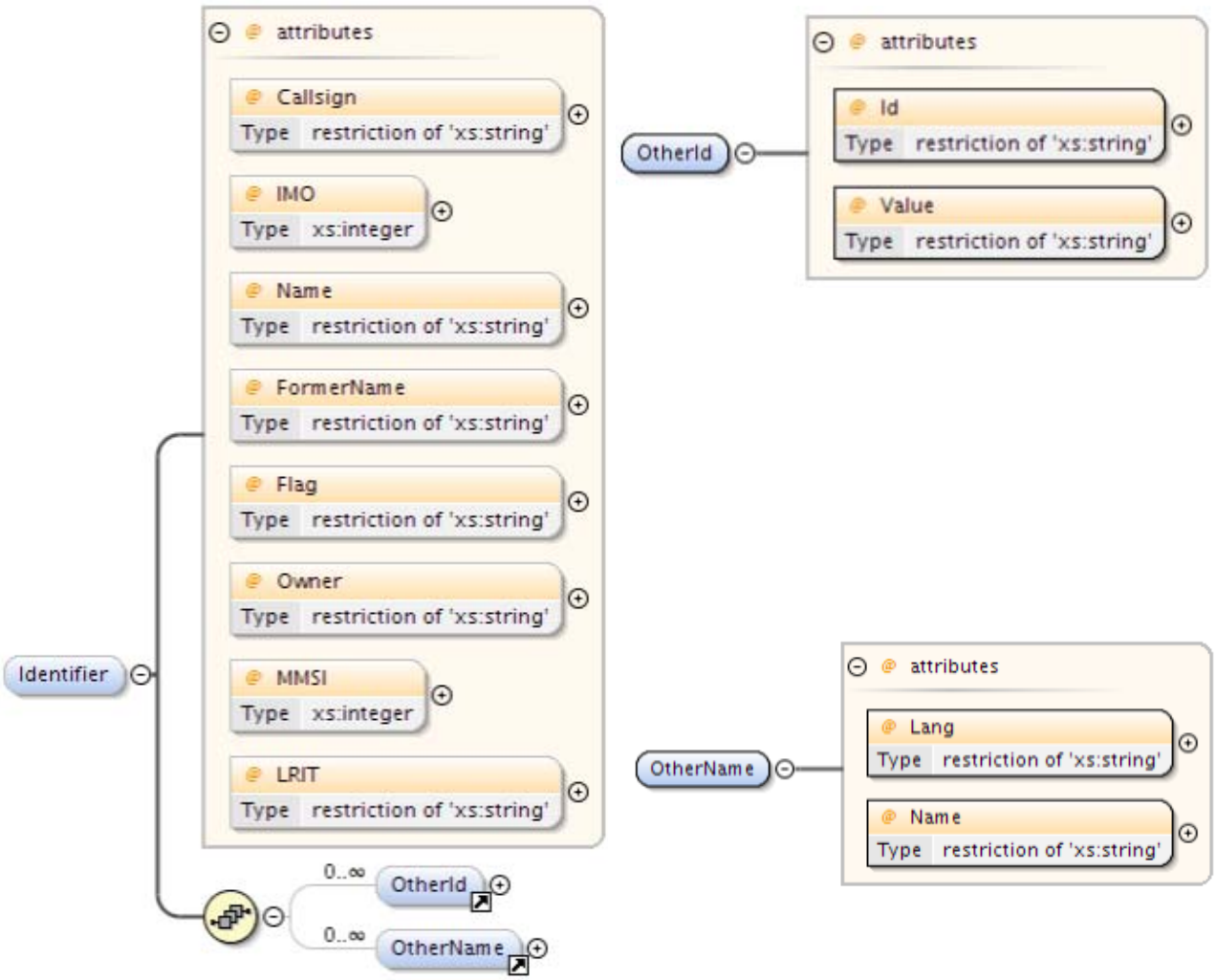


The *VesselData* element consists of the static data of an object as well as a *Construction* element and an *Identifier* element.



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)



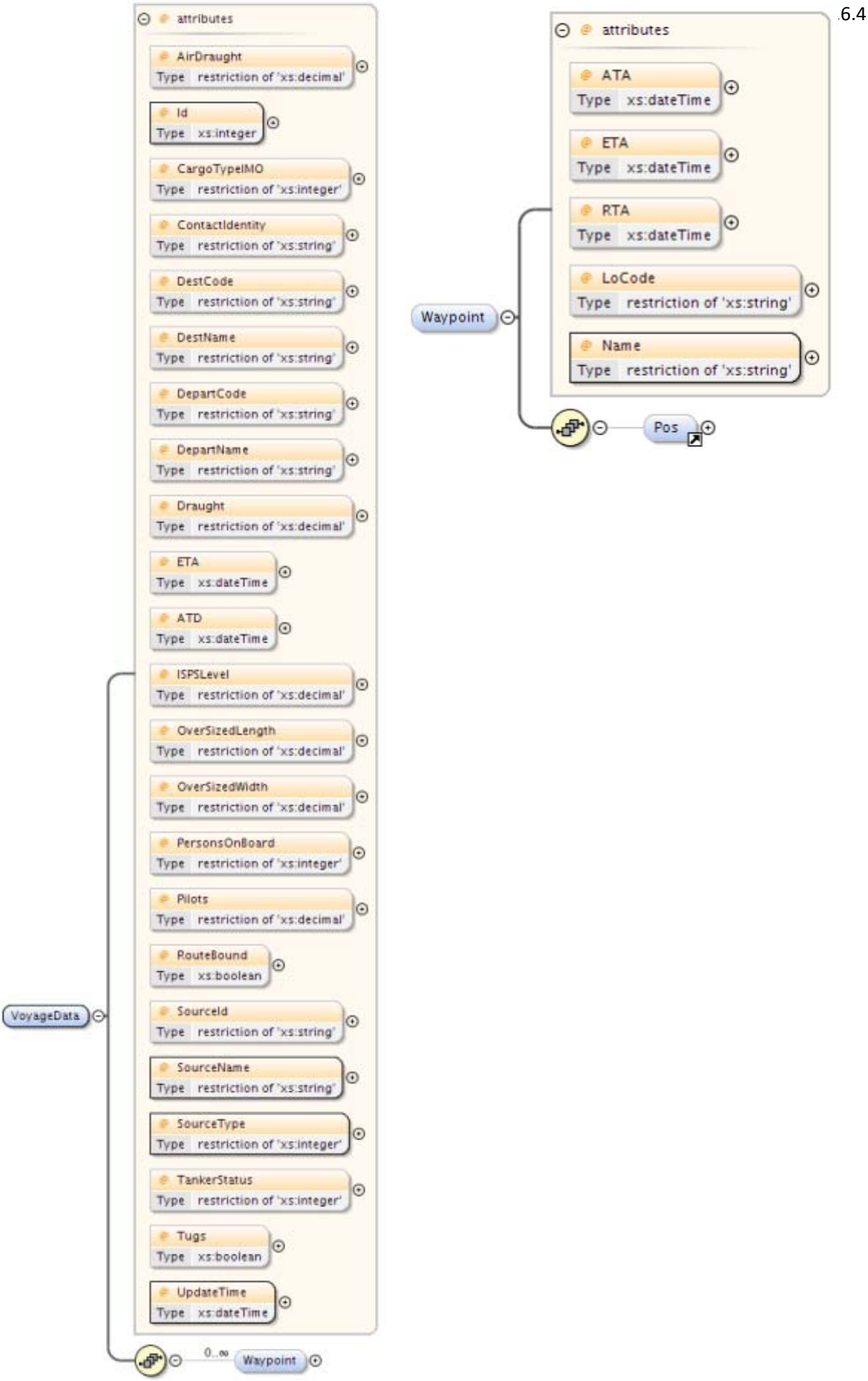
The *Identifier* element consists of the physical construction data of the object (usually a vessel) and the elements *OtherId* and *OtherName.*

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).

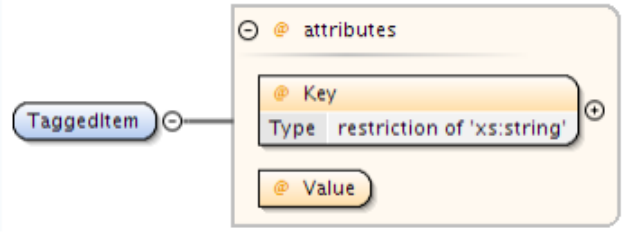

attributes
AirDraught
Type restriction of 'xs:decimal'
Id
Type xs:integer
CargoTypeIMO
Type restriction of 'xs:integer'
ContactIdentity
Type restriction of 'xs:string'
DestCode
Type restriction of 'xs:string'
DestName
Type restriction of 'xs:string'
DepartCode
Type restriction of 'xs:string'
DepartName
Type restriction of 'xs:string'
Draught
Type restriction of 'xs:decimal'
ETA
Type xs:dateTime
ATD
Type xs:dateTime
ISPSLevel
Type restriction of 'xs:decimal'
OverSizedLength
Type restriction of 'xs:decimal'
OverSizedWidth
Type restriction of 'xs:decimal'
PersonsOnBoard
Type restriction of 'xs:integer'
Pilots
Type restriction of 'xs:decimal'
RouteBound
Type xs:boolean
SourceId
Type restriction of 'xs:string'
SourceName
Type restriction of 'xs:string'
SourceType
Type restriction of 'xs:integer'
TankerStatus
Type restriction of 'xs:integer'
Tugs
Type xs:boolean
UpdateTime
Type xs:dateTime
VoyageData
0..∞
Waypoint
attributes
ATA
Type xs:dateTime
ETA
Type xs:dateTime
RTA
Type xs:dateTime
LoCode
Type restriction of 'xs:string'
Name
Type restriction of 'xs:string'
Waypoint
Pos

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.

Attribute ATA

Annotations	Date and time in UTC format (YYYY-MM-DDThh:mmZ) (subset of ISO 8601) of the Actual Time Of Arrival of the target.
Type	**xs:dateTime**
Used by	Element **VoyageData/Waypoint**

Attribute ATD

Annotations	Date and time in (subset of ISO 8601) UTC format (YYYY-MM-DDThh:mm:ss.sssZ) of the Actual Time Of Departure of the target
Type	**xs:dateTime**
Used by	Element **VoyageData**

Attribute AirDraught

Annotations	Actual air draught of the vessel in meters
Type	restriction of **xs:decimal**
Facets	fractionDigits **2** minExclusive **0**
Used by	Element **VoyageData**

Attribute Altitude

Annotations	The altitude of the target above the WGS-84 ellipsoid in meters
Type	**xs:decimal**
Used by	Element **Pos**

Attribute BlackListed

Annotations	Vessel is blacklisted by a NCA
Type	**xs:boolean**
Used by	Element **VesselData**

Attribute COG

Annotations	Course over ground in degrees. (0-360)
Type	restriction of **xs:decimal**
Facets	fractionDigits **1** maxInclusive **360** minInclusive **0**
Used by	Element **TrackData**

Attribute Callsign

Annotations	Callsign of the target, in accordance with Article 19, Section III of the ITU Radio Regulations (RR)
Type	restriction of **xs:string**
Facets	minLength **0** maxLength **9**
Used by	Element **VesselData/Identifier**

Attribute CargoTypeIMO

Annotations	0 = All ships of this type 1 = Carrying DG, HS, or MP, IMO hazard or pollutant category A 2 = Carrying DG, HS, or MP, IMO hazard or pollutant category B 3 = Carrying DG, HS, or MP, IMO hazard or pollutant category C 4 = Carrying DG, HS, or MP, IMO hazard or pollutant category D 5 = Carrying DG, HS, or MP, IMO hazard or pollutant of unknown category
Type	restriction of **xs:integer**

Facets	enumeration	**0**
	enumeration	**1**
	enumeration	**2**
	enumeration	**3**
	enumeration	**4**
	enumeration	**5**
Used by	Element	VoyageData

Attribute Class

Annotations	0 = Unknown 1 = Vessel 2 = Aids to Navigate
Type	restriction of **xs:integer**
Facets	enumeration **0**
	enumeration **1**
	enumeration **2**
Used by	Element VesselData

Attribute CodeA

Type	restriction of **xs:string**	
Facets	pattern	**[0-9A-Z]{2,3}**
Used by	Element	VesselData/Construction/UnType

Attribute CodeB

Type	restriction of **xs:string**	
Facets	pattern	**[1-9A-Z]**
Used by	Element	VesselData/Construction/UnType

Attribute ContactIdentity

Annotations	reference to the identity associated with this objects voyage	
Type	restriction of **xs:string**	
Facets	minLength	**1**
	maxLength	**254**
Used by	Element	VoyageData

Attribute DeadWeight

Annotations	Dead weight in tons
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element VesselData/Construction

Attribute DepartCode

Annotations	Departure of the target (UN/LOCODE) optionally addended with local location code (e.g. BEANR0170100497 = Antwerp, HANSADOK 497)
Type	restriction of **xs:string**
Facets	minLength **5** maxLength **15**
Used by	Element VoyageData

Attribute DepartName

Annotations	Departure name of the target e.g. local code for berth/lock/bridge/terminal
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VoyageData

Attribute DestCode

Annotations	Destination of the target (UN/LOCODE) optionally addended with local location code (e.g. BEANR0170100497 = Antwerp, HANSADOK 497)
Type	restriction of **xs:string**
Facets	minLength **5** maxLength **15**
Used by	Element VoyageData

Attribute DestName

Annotations	Destination name of the target e.g. local code for berth/lock/bridge/terminal
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VoyageData

Attribute Draught

Annotations	Actual draught of the vessel in meters
Type	restriction of **xs:decimal**
Facets	fractionDigits **2** minExclusive **0**
Used by	Element VoyageData

Attribute ETA

Annotations	Date and time in UTC format (YYYY-MM-DDThh:mmZ) (subset of ISO 8601) of the Expected Time Of Arrival of the target.
Type	**xs:dateTime**
Used by	Element VoyageData/Waypoint

Attribute ETA

Annotations	Date and time in (subset of ISO 8601) UTC format (YYYY-MM-DDThh:mm:ss.sssZ) of the Expected Time Of Arrival of the target at the destination
Type	**xs:dateTime**
Used by	Element VoyageData

Attribute EstAccAlt

Annotations	Estimated accuracy standard deviation of the calculated position of a target expressed in m
Type	**xs:decimal**
Used by	Element Pos

Attribute EstAccCOG

Annotations	Estimated accuracy standard deviation of the calculated value expressed in degrees
Type	**xs:decimal**
Used by	Element TrackData

Attribute EstAccLat

Annotations	Estimated accuracy standard deviation of the calculated position of a target expressed in m
Type	**xs:decimal**
Used by	Element Pos

Attribute EstAccLong

Annotations	Estimated accuracy standard deviation of the calculated position of a target expressed in m
Type	**xs:decimal**
Used by	Element Pos

Attribute EstAccSOG

Annotations	Estimated accuracy standard deviation of the calculated value expressed in m/s
Type	**xs:decimal**
Used by	Element TrackData

Attribute Flag

Annotations	The country flag (ISO 3166-1-alpha2)
Type	restriction of **xs:string**
Facets	minLength **2** maxLength **2**
Used by	Element VesselData/Identifier

Attribute FormerName

Annotations	Previous name of the target
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VesselData/Identifier

Attribute GrossWeight

Annotations	Gross weight in tons
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element VesselData/Construction

Attribute Heading

Annotations	Heading of the target in degrees
Type	restriction of **xs:decimal**
Facets	maxInclusive **360.0** minInclusive **0.0**
Used by	Element TrackData

Attribute HullColor

Annotations	Color of Hull (in RGB hex) for SAR operations
Type	restriction of **xs:string**
Facets	minLength **6** maxLength **6**
Used by	Element VesselData/Construction

Attribute HullType

Annotations	Type of hull (1 = single, 2 = double, 3 = triple)
Type	restriction of **xs:integer**
Facets	enumeration **1** enumeration **2** enumeration **3**
Used by	Element VesselData/Construction

Attribute IMO

Annotations	IMO number of the target
Type	**xs:integer**
Used by	Element VesselData/Identifier

Attribute ISPSLevel

Annotations	The ISPS level of the object (1 = normal, 2 = heightended, 3 = exceptional)
Type	restriction of **xs:decimal**
Facets	enumeration **1** enumeration **2** enumeration **3**
Used by	Element VoyageData

Attribute Id

Annotations	The unique identification of this track. Valid from first message with TrackStatus!=Terminated to first message with TrackStatus=Terminated
Type	**xs:integer**
Used by	Element TrackData

Attribute Id

Annotations	Name of the Identifier
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element **OtherId**

Attribute Id

Annotations	The unique identification of this vesseldata. Valid from first message with TrackStatus!=Terminated to first message with TrackStatus=Terminated
Type	**xs:integer**
Used by	Element **VesselData**

Attribute Id

Annotations	The unique identification of this voyagedata. Valid from first message with TrackStatus!=Terminated to first message with TrackStatus=Terminated
Type	**xs:integer**
Used by	Element **VoyageData**

Attribute Key

Annotations	Key for the tagged item
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element **TaggedItem**

Attribute LRIT

Annotations	LRIT identification
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element **VesselData/Identifier**

Attribute Lang

Annotations	Languange (ISO 3166-1-alpha2)
Type	restriction of **xs:string**
Facets	minLength **2**
	maxLength **2**
Used by	Element OtherName

Attribute Lat

Annotations	Latitude (WGS84) in degrees. (+/- 90 degrees; North = positive; South = negative) Examples: -90deg (south) = -90.0000000 0deg0min1sec (north) = 0.0000016 50deg50min (north) = 50.8333333
Type	restriction of **xs:decimal**
Facets	fractionDigits **5** maxInclusive **+90.00000** minInclusive **-90.00000**
Used by	Element Pos

Attribute Length

Annotations	Measured length of the target in meter
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element TrackData

Attribute Length

Annotations	The overall length of the target in meter as confirmed by NCA
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element VesselData/Construction

Attribute LloydsShipType

Annotations	Number indicating type of vessel
Type	**xs:integer**
Used by	Element **VesselData/Construction**

Attribute LoCode

Annotations	Waypoint name in UN/LOCODE optionally addended with local location code (e.g. BEANR0170100497 = Antwerp, HANSADOK 497)
Type	restriction of **xs:string**
Facets	minLength **5** maxLength **15**
Used by	Element **VoyageData/Waypoint**

Attribute Long

Annotations	Longitude (WGS84) in degrees. (+/- 180 degrees; East = positive; West = negative). Examples: -180deg (west) = -180.0000000 0deg0min1sec (east) = 0.0000016
Type	restriction of **xs:decimal**
Facets	fractionDigits **5** maxInclusive **+180.00000** minExclusive **-180.00000**
Used by	Element **Pos**

Attribute MMSI

Annotations	MMSI number of the target
Type	**xs:integer**
Used by	Element VesselData/Identifier

Attribute MaxAirDraught

Annotations	Maximum air draught of the object in meters, to be used if voyage data is not available
Type	restriction of **xs:decimal**
Facets	fractionDigits **1** minExclusive **0**
Used by	Element VesselData/Construction

Attribute MaxDraught

Annotations	Maximum draught of the object in meters, to be used if voyage data is not available
Type	restriction of **xs:decimal**
Facets	fractionDigits **1** minExclusive **0**
Used by	Element VesselData/Construction

Attribute MaxPersonsOnBoard

Annotations	The maximum number of persons on board of the object (crew, support, passengers, pilots)
Type	restriction of **xs:integer**
Facets	minExclusive **0**
Used by	Element VesselData/Construction

Attribute MaxSpeed

Annotations	The maximum speed the object is able to sustain with normal draft and load
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element VesselData/Construction

Attribute Mode

Type	restriction of **xs:integer**
Facets	enumeration **1** enumeration **2** enumeration **3** enumeration **4** enumeration **6** enumeration **7** enumeration **8**
Used by	Element VesselData/Construction/UnType

Attribute Name

Annotations	Name in the foreign language
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element OtherName

Attribute Name

Annotations	Name of the target
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VesselData/Identifier

Attribute Name

Annotations	Name of the waypoint
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VoyageData/Waypoint

Attribute Name

Annotations	Name of the area
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element Area

Attribute OverSizedLength

Annotations	Length of the target in meter as confirmed by NCA, in case of a convoy of barges
Type	restriction of **xs:decimal**
Facets	fractionDigits **1** minExclusive **0**
Used by	Element VoyageData

Attribute OverSizedWidth

Annotations	Width of the target in meter as confirmed by the NCA, in case of a convoy of barges
Type	restriction of **xs:decimal**

Facets	fractionDigits **1** minExclusive **0**
Used by	Element **VoyageData**

Attribute Owner

Annotations	Name of owner the target
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element **VesselData/Identifier**

Attribute PersonsOnBoard

Annotations	The number of persons on board of the object, should equal the sum of crew, passengers and support personel if available
Type	restriction of **xs:integer**
Facets	minExclusive **0**
Used by	Element VoyageData

Attribute Pilots

Annotations	Pilot status 0 = unknown 1 = pilot on board 2 = object under remote pilotage 3 = pilot required
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element VoyageData

Attribute ROT

Annotations	Rate of turn in degrees per minute
Type	restriction of **xs:decimal**
Facets	fractionDigits **1** maxInclusive **720** minExclusive **-720**
Used by	Element TrackData

Attribute RTA

Annotations	Date and time in UTC format (YYYY-MM-DDThh:mmZ) (subset of ISO 8601) of the Requested Time Of Arrival of the target.
Type	**xs:dateTime**
Used by	Element VoyageData/Waypoint

Attribute Result

Annotations	1 = Accepted 2 = Declined
Type	restriction of **xs:integer**
Facets	enumeration **1** enumeration **2**
Used by	Element LoginResponse

Attribute RouteBound

Annotations	This object is bound to the route of this voyage
Type	**xs:boolean**
Used by	Element VoyageData

Attribute SOG

Annotations	Speed over ground in meters per second
Type	restriction of **xs:decimal**
Facets	fractionDigits **1** minInclusive **0**
Used by	Element TrackData

Attribute SourceId

Annotations	Unique identification of the producer (UN/LOCODE) in case multiple producers exist on the same LOCODE, the local competent authority can optionally addended this with a local code (e.g. BE ANR 01 = Antwerp, 01)
Type	restriction of **xs:string**
Facets	minLength **5** maxLength **15**
Used by	Element **TrackData**

Attribute SourceId

Annotations	Unique identification of the producer (UN/LOCODE) in case multiple producers exist on the same LOCODE, the local competent authority can optionally addended this with a local code (e.g. BE ANR 01 = Antwerp, 01)
Type	restriction of **xs:string**
Facets	minLength **5** maxLength **15**
Used by	Element **VesselData**

Attribute SourceId

Annotations	Unique identification of the producer (UN/LOCODE) in case multiple producers exist on the
	same LOCODE, the local competent authority can optionally addended this with a local code (e.g. BE ANR 01 = Antwerp, 01)
Type	restriction of **xs:string**
Facets	minLength **5** maxLength **15**
Used by	Element **VoyageData**

Attribute SourceName

Annotations	Identification of the originator of the data
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element TrackData

Attribute SourceName

Annotations	Identification of the originator of the data
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VesselData

Attribute SourceName

Annotations	Identification of the originator of this data
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element VoyageData

Attribute SourceType

Annotations	Source/originator type: 0 = Unknown, 1 = Transponder, 2 = Database (VTS Plan Server), 3 = Manual (VTS Officer), 4 = Fused, 5 = External Source
Type	restriction of **xs:integer**
Facets	enumeration **1** enumeration **2** enumeration **3** enumeration **4** enumeration **5**
Used by	Element VesselData

Attribute SpecialAttention

Annotations	Vessel is under special attention of the NCA or fairway authorities
Type	restriction of **xs:string**
Facets	maxLength **20**
Used by	Element VesselData

Attribute TankerStatus

Annotations	Describes the status of the tanker 0 = Non gas free 1 = Gas free 2 = Inert
Type	restriction of **xs:integer**
Facets	enumeration **0** enumeration **1** enumeration **2**
Used by	Element VoyageData

Attribute TrackStatus

Annotations	1 = Updated, (sensors are updating the track) 2 = Coasted, (no sensor is updating the track) 3 = Dropped
Type	restriction of **xs:integer**
Facets	enumeration **1** enumeration **2** enumeration **3**
Used by	Element TrackData

Attribute Tugs

Annotations	Object uses tugs
Type	**xs:boolean**
Used by	Element VoyageData

Attribute UpdateTime

Annotations	Date and time in UTC format (YYYY-MM-DDThh:mm:ss.sssZ) (subset of ISO 8601) this position was measured.
Type	**xs:dateTime**
Used by	Element TrackData

Attribute UpdateTime

Annotations	Date and time in UTC format (YYYY-MM-DDThh:mm:ss.sssZ) (subset of ISO 8601) this data was compiled
Type	**xs:dateTime**
Used by	Element VesselData

Attribute UpdateTime

Annotations	Date and time in (subset of ISO 8601) UTC format (YYYY-MM-DDThh:mm:ss.sssZ) this data was compiled
Type	**xs:dateTime**
Used by	Element VoyageData

Attribute Value

Annotations	Navigation status of the target 0 = under way using engine 1 = at anchor 2 = not under command 3 = restricted manoeuvrability 4 = constrained by her draught 5 = moored 6 = aground 7 = engaged in fishing 8 = under way sailing 9 = engaged in fishing other than trawling 10 = air-cushion vessel in non displacement mode or WIG craft taking off, landing or in flight 11 = power driven vessel towing astern 12 = power driven vessel pushing ahead or towing alongside 13 = in distress or requiring assistance 14 = AIS SART, seeking to attract attention 15 = undefined default
Type	restriction of **xs:integer**
Facets	maxInclusive **15** minInclusive **0**
Used by	Element TrackData/NavStatus

Attribute Value

Annotations	Value of the identifier
Type	restriction of **xs:string**
Facets	minLength **1** maxLength **42**
Used by	Element OtherId

Attribute Value

Annotations	Value of the tagged item, can be of any type
Used by	Element TaggedItem

Attribute Width

Annotations	Measured Width of the target in meter
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element TrackData

Attribute Width

Annotations	Overall width of the target in meter as confirmed by the NCA
Type	restriction of **xs:decimal**
Facets	minExclusive **0**
Used by	Element VesselData/Construction

Attribute YearOfBuild

Annotations	The year the vessel was build in 4 digits e.g. 2010
Type	restriction of **xs:integer**
Facets	totalDigits **4**
Used by	Element VesselData/Construction

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	-

Element name	Data
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

Element name	Data
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

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