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ARM  ENG  PAP  Input

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**Agenda item** [[2]](#footnote-2) n.n

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**Author(s)/Submitter(s)** China MSA

Proposal to Supplement the Guideline for Shore VDES Infrastructure with a Chapter on Data Service Interface Specification [[3]](#footnote-3)

# Summary

The DTEC1 meeting proposed the development of a new guideline for shore VDES infrastructure, intended to integrate the content of Recommendations R0124 and R1007. At the DTEC4 meeting, ALLFORLAND further refined the draft and invited contributions from members to finalize this guideline. This proposal recommends supplementing the guideline for shore VDES infrastructure with a specification for data service interfaces for VDES shore systems. An example illustrating the use of UTF-8 as a basis for such an interface specification is provided in Appendix A, serving as a reference for the subsequent development of a complete specification.

## Purpose of the document

This document aims to propose the inclusion of a service interface specification based on the S-100 framework within the guideline for shore VDES infrastructure. It seeks endorsement from the IALA DTEC5 Committee for adopting an S-100 framework-based user interface in the Guideline. The Committee is also requested to consider the accompanying draft interface specification for inclusion as part of the guideline, subject to further development and refinement.

## Related documents

1. ITU-R M.2092-1, Technical characteristics for a VHF data exchange system in the VHF maritime mobile band, February 2022
2. IALA G1117, VHF Data Exchange System (VDES) Overview, December 2022
3. IALA R1007, The VHF Data Exchange System (VDES) for Shore Infrastructure, June 2017
4. IALA R0124 Ed2.2, The AIS Service, December 2012
5. IHO S-100 Universal Hydrographic Data Model, Edition 5.2.0, 2024
6. IALA S-201 Aids to Navigation Information Product Specification, Ed.1.9.0, 2025

# Background

The shore VDES infrastructure is responsible for exchanging data with shipborne terminals and other shore-based VDES users. Following the practice of traditional AIS shore-based services, the shore-based user interface utilizes "NMEA" sentences in the IEC 62320-1 format to transmit AIS messages. This interface approach is based on low-level messages, requiring developers to handle details such as bit encoding and message parsing, which increases development complexity and the risk of errors.

While IALA Recommendation R0124 defines an XML-based VDES data interface named MDEF for information exchange between shore infrastructure and users, it only outlines the main elements without providing a complete data model or exchange specification. Consequently, this interface is difficult to implement for practical data exchange applications.

VDES involves more complex information exchange patterns than AIS, and its full range of shore services cannot be realized using the sentence-based structure of IEC 63514. Unlike AIS, which primarily focuses on broadcasting vessels' dynamic and static information to users, VDES necessitates extensive interaction. It may also need to support interoperability between national authorities, with satellite systems, and potentially with the MCP in the future. A unified standard is essential for these interactions to support the broad integration of VDES applications.

# Discussion

## Issues with the Current Interface Approach

Current AIS interfaces publish data through standardized message sentences (e.g., vessel reports, navigation-related information). This NMEA-based interface requires developers to have an in-depth understanding of the AIS message structure for data parsing and encapsulation, making development difficult and error-prone. As VDES functionalities extend beyond those of traditional AIS, continuing to use a low-level sentence-based interface would further increase implementation complexity and limit the ability to interact with new data types.

## Advantages of Adopting the S-100 Framework

### Improved Compatibility

Data modeled under the S-100 framework possesses a standard structure and semantic identity. This allows national authorities and users to directly integrate it into their respective S-100 compatible systems, achieving consistency and interoperability with other maritime services. A common S-100 service interface can be used to exchange various types of information, not limited to a specific purpose, thereby enhancing technical interoperability.

### Simplified Integration

By leveraging the online service mechanisms defined in S-100, interfaces can be provided using mature web service technologies like REST/SOAP. Developers would no longer need to handle link-layer details; they could simply request or subscribe to the required datasets via a standard API. This service-oriented architecture lowers the barrier for integration and reduces the development burden associated with parsing low-level messages.

### Abstraction of Complex Low-Level Operations

The shore system would act as a service provider, delivering processed, high-level information to clients. For example, in a vessel reporting application, the shore station could directly provide a standardized S-100 object (e.g., a "Vessel Position Report" feature). The client would receive object data with geographic coordinates, timestamps, and attributes, without needing to know the source message type or the field mappings used to generate it.

Similarly, for broadcast services, the interface would acquire the necessary data elements and send NMEA commands to the base station via the shore VDES system, abstracting away low-level control processes such as base station selection and link ID management. This encapsulation strategy conceals the underlying details of VDES communication, presenting a clean and consistent data view to the end-user, which not only simplifies integration but also enhances security.

### Reuse of Existing Standards and Tools

The S-100 system already provides a suite of specifications and tools for functions like metadata encoding, data encryption and signing, and exchange set packaging. Adopting an S-100 interface would allow the shore VDES system to reuse these existing standard assets—for instance, using the S-100 Exchange Set standard to package VDES data or employing existing S-100 database schemas for information storage. This would reduce the effort required to design a new interface from scratch.

# References

1. ITU-R M.2092-1, Technical characteristics for a VHF data exchange system in the VHF maritime mobile band, February 2022
2. IALA G1117, VHF Data Exchange System (VDES) Overview, December 2022
3. IALA R1007, The VHF Data Exchange System (VDES) for Shore Infrastructure, June 2017
4. IALA R0124 Ed2.2, The AIS Service, December 2012
5. IHO S-100 Universal Hydrographic Data Model, Edition 5.2.0, 2024
6. IALA S-201 Aids to Navigation Information Product Specification, Ed.1.9.0, 2025.

# Action requested of the Committee

The Committee is requested to:

Consider the recommendation to add a data service interface specification based on S-100 to the new guideline for shore VDES infrastructure.

1. UTF-8 Information Transmission
   1. Application Model

The application model for this service interface adopts a feature-based approach. The core of this approach is the definition of a single feature type: VDES\_TransmissionRequest. This feature encapsulates all parameters required to initiate a VDES data broadcast, including requestor information, transmission parameters, and the message payload.

The VDES\_TransmissionRequest feature consists of three core complex attributes:

* requestorInformation: Used to identify and verify the originator of the request.
* TransmissionParameters: Defines the target (addressed or broadcast) and scope (a specific list of MMSIs or a geographical area) of the transmission.
* messagePayload: Contains the specific data content to be transmission.

This structured model organizes a complete transmission request into a single, logically cohesive data unit that conforms to S-100 principles.

* 1. Feature Catalogue

This section defines in detail the VDES\_TransmissionRequest feature and its associated complex attributes and enumeration values.

1. VDES\_TransmissionRequest Feature Definition

|  |  |
| --- | --- |
| Feature Name | VDES\_TransmissionRequest |
| Definition | An element encapsulating all information required to submit a data transmission request to the VDES shore-based system. |
| Feature Use Type | Geographic |
| Geometric Primitive | No Geometry (noGeometry) |
| Attribute Binding | |
| S-100 Attribute | Type |
| requestorInformation | VDES\_RequestorInformation |
| transmissionParameters | VDES\_TransmissionParameters |
| messagePayload | VDES\_MessagePayload |

1. VDES\_RequestorInformation Complex Attribute Definition

|  |  |
| --- | --- |
| Attribute Name | VDES\_RequestorInformation |
| Definition | A complex attribute containing the identity and authentication information of the request initiator. |
| Type | Complex Attribute |
| Sub-attribute Binding | |
| S-100 Attribute | Type |
| organization | CharacterString |
| user | CharacterString |
| password | CharacterString |

1. VDES\_TransmissionParameters Complex Attribute Definition

|  |  |
| --- | --- |
| Attribute Name | VDES\_TransmissionParameters |
| Definition | A complex attribute defining the Transmission target and scope. |
| Type | Complex Attribute |
| Sub-attribute Binding | |
| S-100 Attribute | Type |
| transmissionType | VDES\_TransmissionType (Enum) |
| targetMMSI | CharacterString |
| transmissionRegion | GM\_Polygon |
| **acknowledgementRequired** | Boolean |
| **validUntil** | DateTime |

1. VDES\_MessagePayload Complex Attribute Definition

|  |  |
| --- | --- |
| Attribute Name | VDES\_MessagePayload |
| Definition | A complex attribute containing the data content to be Transmission. |
| Type | Complex Attribute |
| Sub-attribute Binding | |
| S-100 Attribute | Type |
| VPFI | CharacterString |
| messageID | CharacterString |
| messageContent | CharacterString |

* 1. Units of Measurement

All units of measure used in this specification must adhere to the International System of Units (SI) and common practices within the maritime domain:

* Geographic Coordinates: Latitude and longitude must be expressed in decimal degrees.
* Distance: When defining geometric objects (e.g., the radius of a gml:CircleByCenterPoint), the unit of distance must be the nautical mile
  1. GML Encoding Specification

All VDES\_TransmissionRequest requests must be encoded as XML documents compliant with IHO S-100 Part 10b (GML Application Schema).

* XML Declaration: Each GML document must begin with an XML declaration specifying the XML version and encoding format, e.g., <?xml version="1.0" encoding="UTF-8"?>.
* Namespaces: GML documents must correctly declare the namespaces they use, including the target namespace of this product specification, the GML namespace, and the XML Schema instance namespace.
* Character Encoding: All textual content must use UTF-8 encoding to support multi-language characters.
* Coordinate Encoding: Geographic coordinate values should be encoded in decimal degrees, with at least 7 digits after the decimal point to ensure sufficient precision.
* Null Value Handling: For optional attributes, if their value is unknown or not applicable, the attribute tag should be completely omitted in the GML document. Empty tags or nilled attributes must not be used to represent them.

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