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Proposal on improving the ASM Application protocol

Summary

In June 2025, IMO MSC 110 has adopted amendments to incorporate VDES into SOLAS Chapter V. This amendment is scheduled for final adoption at MSC 111 and is expected to enter into force on January 1, 2028. Concurrently, the revision of ITU-R M.2092-1 is nearing completion, leading to increasingly mature technical characteristics and specifications for VDES.

However, compared to the well-established physical and data link layer protocols, research into VDES application data formats that ensure global interoperability remains insufficient. In particular, the data application protocol for ASM has not been updated in a timely manner, preventing the full utilization of new VDES features.

Purpose of the document

This proposal aims to systematically analyze the key issues within the current ASM data application protocol and to put forward a set of concrete, actionable recommendations to promote its application, with the goal of establishing an efficient and internationally harmonized ASM application protocol framework.

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] ITU-R M.1371-5, Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band, February 2014

[3] IMO SN.1/Circ.289, GUIDANCE ON THE USE OF AIS APPLICATION-SPECIFIC MESSAGES, June 2010

[4] IALA G1117, VHF Data Exchange System(VDES) Overview, December 2022.

Background

* 1. **AIS-ASM**

The technical characteristics of AIS are detailed in Recommendation ITU-R M.1371-5. In this standard, four binary message types are designated for ASM: Message 6 (Binary addressed message), Message 8 (Binary broadcast message), Message 25 (Single slot binary message), and Message 26 (Multiple slot binary message with Communications State).

To regulate the use of these binary messages, IMO published SN.1/Circ.289 in 2010, defining 22 categories of international region AIS-ASM. These messages are distinguished by a Functional Identifier (FI) field within the binary messages and are intended to simplify ship reporting, reduce verbal communication, and enhance the reliability of information exchange. However, the scope of this circular is explicitly limited to transmissions using AIS Messages 6 and 8.

* 1. **VDES-ASM**

The emerging problem of channel congestion on the AIS VDL prompted the development of VDES. VDES is designed as an information exchange system comprising AIS, ASM, and the higher data rate VHF Data Exchange (VDE) components.

Recommendation ITU-R M.2092-1 provides comprehensive specifications for the VDES air interface. It defines eight new message types for ASM: Message 0 for encapsulation; Messages 1, 2, 3, 4, and 6 for carrying ASM application data; and Message 8 for signaling control. These messages are transmitted over two dedicated ASM channels (ASM 1 and ASM 2).

In its Guideline G1117, VDES Overview (Ed. 3.0), published in late 2022, IALA provided a preliminary definition of the top-level application architecture for VDES. This document introduced the concept of the VDE Protocol Format Identifier (VPFI) to distinguish different application information types, with VPFI=02 being defined as VDES Application-Specific Messages. G1117 also defined specific message formats for VDES Application-Specific Messages, such as UTF-8 and 6-bit ASCII.

Discussion

Existing Problems in the ASM Application Protocol

* + 1. **Message Compatibility Limitations of CIRC.289**

The transmission of ASM information on the AIS VDL currently relies primarily on IMO SN.1/Circ.289, published in 2010. At the time of its drafting, the application of AIS Messages 25 and 26 was not yet widespread although their characteristics were already defined in the ITU standard. As a result, only Messages 6 and 8 are permited for transmitting the international region ASM it defines in Circ.289.

AIS Message 25 (Single Slot Binary Message) is highly efficient for small data packets, as it can carry 128 bits of binary data within a single time slot. This makes it an ideal choice for many ASM applications information that require the frequent transmission of short data.

In contrast, AIS Message 26 (Multiple slot binary message with Communications State) provides a better solution for messages transmitting larger data blocks or requiring high reliability. Its advantages are twofold. Firstly, it can occupy up to five consecutive time slots, making it suitable for ASM that exceed the capacity of a single slot. Secondly, and more critically, Message 26 includes a 19-bit "Communications State" field. This field enables the message to utilize more reliable channel access schemes, such as Self-Organizing Time Division Multiple Access (SOTDMA) and Incremental Time Division Multiple Access (ITDMA). Through slot pre-announcement and reservation mechanisms, SOTDMA and ITDMA significantly reduce the probability of message collisions in congested channels, thereby increasing the transmission success rate.

The lack of support for Messages 25 and 26 in SN.1/Circ.289 therefore fundamentally limits the ability to efficiently transmit ASM over the AIS VDL.

* + 1. **Lack of Application Standards for Dedicated ASM Channels**

To address the congestion issue on the AIS VDL, VDES introduced two dedicated ASM channels (ASM 1 and ASM 2). Currently, no dedicated application layer standard exists for these channels. Directly applying the protocol from IMO SN.1/Circ.289 would not only fail to leverage their technical advantages but also lead to significant resource wastage.

The VDES standard introduces a new channel access scheme for the dedicated ASM channels: Multi-frame Incremental Time Division Multiple Access (MITDMA). MITDMA allows for the linking of up to 15 blocks to form a single large data block for transmission. This capability is crucial for maritime digitalization and future developments, as it provides the technical foundation for distributing large-volume data products, such as gridded meteorological or hydrographic forecasts, which are too large to be encapsulated in a few time slots. However, the existing IMO SN.1/Circ.289 protocol cannot utilize the MITDMA mechanism at all, leaving this core functionality unused.

* + 1. **Need for Enhanced IALA Capability in ASM Protocol Coordination**

First, the IALA webpage " Collection of regional applications for AIS ASM " is a vital platform for coordinating national ASM applications. However, its current classification and submission mechanism is based entirely on the traditional AIS framework. It does not provide any means or classification system for competent authorities to submit or query new message formats designed for the dedicated ASM channels.

Second, while IALA G1117 VDES Overview serves as a guiding document, it is somewhat insufficient at the detailed application protocol. The document defines multiple VDE Protocol Format Identifiers (VPFIs), such as VPFI=00 (cryptography-related messages), VPFI=04 (Maritime Connectivity Platform MCP messages), and VPFI=06 (GNSS augmentation information), and also defines eight message types for VPFI=02 (VDES Application Specific Messages). However, due to time constraints during its development, the definitions of specific data formats and message structures under VPFI=02 in G1117 are incomplete and cannot fully support potential data products and services.

Recommendations for Coordinating and Enhancing ASM Protocols

* + 1. **Enhancing AIS-ASM Capabilities through a Minor Revision of IMO SN.1/Circ.289**

It is recommended to promote a minor revision of circular SN.1/Circ.289 to explicitly permit and utilize AIS Messages 25 and 26 for carrying these ASM messages. Specific suggestions are as follows:

1 For ASM with a data payload of less than 128 bits, allow the use of AIS Message 25 to maximize time-slot efficiency.

2 For ASM with a data payload more than 128 bits or requiring higher transmission reliability, allow the use of AIS Message 26 to leverage its multi-slot capability and support for reliable access schemes like SOTDMA/ITDMA.

* + 1. **Establishing a New IALA Work Item for ASM Dedicated Channel Application Protocol**

To fundamentally address the issues described in Section 3.1.2, it is proposed that the DTEC Committee establish a new work item. Its objective would be to draft a new Guideline specifically for defining the international region ASM protocols to be used on the dedicated ASM channels (ASM 1 and ASM 2).

This new protocol should include at least the following core elements:

Unified Message Format: Define a harmonized message format that is compatible with the VDES ASM message types specified in ITU-R M.2092-1.

Standardized Data Structures: Specify standard data structures for various information types to ensure interoperability between equipment from different manufacturers.

Large-Volume Data Transmission Mechanism: Clearly define how to utilize the MITDMA access scheme for transmitting large data blocks.

Application Identifier Management: Establish a clear process for defining, registering, managing, and sharing new application identifiers within the new protocol framework to accommodate emerging application needs.

* + 1. **Enhancing Regional ASM Information Sharing of IALA**

To prevent the fragmentation of regional standards, it is recommended that the IALA Secretariat upgrade its online webpage " Collection of regional applications for AIS ASM " (www.iala.int/asm). The upgrade should add support for messages on the dedicated ASM channels, enabling the submission and querying of VDES ASM formats.

* + 1. **Promote Phased Development of VDE Application Protocols**

The VDE Protocol Format Identifiers (VPFIs) defined in IALA G1117 cover multiple, vastly different application areas, each with varying levels of complexity, technical maturity, and urgency for standardization. Therefore, it is recommended restructuring IALA G1117 into a high-level framework document. The detailed technical specifications for each VPFI would be developed as separate, normative appendices. This approach has successful precedents within IALA, such as Recommendation R0124 on The AIS Service, which defines different services through multiple annexes.

By adopting this method, the technical specifications for each VPFI can be developed in parallel or sequentially according to their maturity. Once a specification for a VPFI (e.g., VPFI=04) is completed and approved by the Committee, it can be immediately published as a new appendix to G1117 for industry use, while other VPFIs still under development will not affect the application of those already published.

1. **References**
2. ITU-R M.2092-1, Technical characteristics for a VHF data exchange system in the VHF maritime mobile band, February 2022
3. ITU-R M.1371-5, Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile frequency band, February 2014
4. IMO SN.1/Circ.289, GUIDANCE ON THE USE OF AIS APPLICATION-SPECIFIC MESSAGES, June 2010
5. IALA G1117, VHF Data Exchange System(VDES) Overview, December 2022
6. RTCM 13900.0, Maritime Messaging Service Architecture and Protocol.
7. **Action requested of the Committee**

The Committee is requested to consider the recommendation in this document and take actions as appropriate.