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Proposal for Revising IMO SN.1/Circ 289 to Adapt to VDE-ASM

# Summary

The current IMO SN.1/Circ.289 Guidance on the use of AIS Application-Specific Messages defines the rules for broadcasting ASM using AIS message 6 and message 8, which cannot be directly applied to VDE-ASM. In the future, AIS-ASM will gradually transit to VDE-ASM. There is a need to revise IMO SN.1/Circ 289 to accommodate the broadcasting rules of VDE-ASM messages. The IMO is considering revising Circ.289 to make it mandatory and adapt to the capacity and functionality of VDES. Therefore, it is necessary for IALA to carry out the related work to promote the revision of Circ.289. DTEC 3 is requested to consider the relevant modification suggestions in this proposal.

## Purpose of the document

The purpose of this document is to revise IMO SN.1/Circ.289 by adding the ASM definition applicable to VDE-ASM message broadcasting rules, enabling transmission on both AIS and VDE-ASM.

## Related documents

1. IMO SN.1/Circ.289, Guidance on the use of AIS Application-Specific Messages, June 2010
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

# Background

At the last DTEC meeting, China submitted the overall plan for the "Proposals on Adapting AIS Binary Information to VDE-ASM". The DTEC2 report suggested that China to submit more relevant inputs at the next meeting. Considering the adaptation needs of ASM, a specific plan for the revision of IMO SN.1/Circ 289 was proposed to provide a reference for subsequent related work.

# Discussion

## Broadcasting of Application Specific Messages in Current IMO SN.1/Circ 289

In the current IMO SN.1/Circ.289, the broadcasting status of Application Specific Messages through AIS messages 6 and 8 is shown in Table 1. The specific definition of the broadcast message can be found in IMO SN.1/Circ.289 Annex AIS Application Specific Messages Recommended for International Use.

*Table 1*

*Summary of AIS Application-Specific Messages*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DAC** | **FI** | **Application-Specific Messages type** | **AIS 6** | **AIS 8** |
| 001 | 16 | Number of persons on board | Support | Not support |
| 001 | 17 | VTS-generated/synthetic targets | Not support | Support |
| 001 | 18 | Clearance time to enter port | Support | Not support |
| 001 | 19 | Marine traffic signal | Not support | Support |
| 001 | 20 | Berthing data | Support | Not support |
| 001 | 21 | Weather observation report from ship | Not support | Support |
| 001 | 22 | Area notice – broadcast | Not support | Support |
| 001 | 23 | Area notice – addressed | Support | Not support |
| 001 | 24 | Extended ship static and voyage-related data | Not support | Support |
| 001 | 25 | Dangerous cargo indication | Support | Not support |
| 001 | 26 | Environmental | Not support | Support |
| 001 | 27 | Route information – broadcast | Not support | Support |
| 001 | 28 | Route information – addressed | Support | Not support |
| 001 | 29 | Text description – broadcast | Not support | Support |
| 001 | 30 | Text description – addressed | Support | Not support |
| 001 | 31 | Meteorological and Hydrographic data | Not support | Support |
| 001 | 32 | Tidal window | Support | Not support |

## Problems with the current IMO SN.1/Circ 289

The current IMO SN.1/Circ.289 only defines the broadcasting rules applicable to AIS messages 6 and 8, which cannot be directly applied to VDE-ASM. It is necessary to supplement how to broadcast the relevant provisions of ASM in IMO SN.1/Circ.289 using VDE-ASM messages.

## Proposed amendments to the current IMO SN.1/Circ 289

The revision of IMO SN.1/Circ 289 should fully utilize the capacity and functionality of VDES. In this regard, the application field lengths of different messages in VDE-ASM should be considered first, as well as the adaptability of the existing application messages in IMO SN.1/Circ 289 to the five types of VDE-ASM messages. On this basis, introducing a flexible message length mechanism can achieve better payload utilization under various circumstances. The following text provides the calculation of VDE-ASM message lengths, a preliminary analysis of the adaptability of IMO SN.1/Circ 289 application messages, and an example of modified hydro-meteorological information (FI=31).

### calculation of the application field length in vde-asm messages

Determine the length of the application fields for various messages in VDE-ASM to accommodate binary data information. The specific lengths of the application fields for VDE-ASM message 1, message 2, message 3, message 4, and message 6 are shown in Tables 2, 3, 4, 5, and 6, respectively. The lengths of the application fields for AIS message 6 and message 8 are shown in Tables 7 and 8. The calculation of the maximum number of binary data bits in the tables does not include AI (Application specific message identifier) and is divided into two cases: with FEC and without FEC.

*TABLE 2*

*Correspondence between the number of slots and the maximum number of binary bits for reservation broadcast messages (VDE-ASM Message 1)*

|  |  |  |  |
| --- | --- | --- | --- |
| **Number of time slots** | **Transmission group** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bit (FEC)**  **bit** |
| 1 | 1 | 240 | 144 |
| 2 | 2 | 480 | 288 |
| 3 | 2 | 992 | 672 |
| 4 | 2 | 1504 | 1056 |
| 5 | 3 | 1744 | 1200 |
| 6 | 3 | 2256 | 1584 |
| 7 | 3 | 2768 | 1968 |
| 8 | 4 | 3008 | 2112 |
| 9 | 4 | 3520 | 2496 |
| 10 | 4 | 4032 | 2880 |
| 11 | 5 | 4272 | 3024 |
| 12 | 5 | 4784 | 3408 |
| 13 | 5 | 5296 | 3792 |
| 14 | 6 | 5536 | 3936 |
| 15 | 6 | 6048 | 4320 |
| 16 | 6 | 6560 | 4704 |
| 17 | 7 | 6800 | 4848 |
| 18 | 7 | 7312 | 5232 |
| 19 | 7 | 7824 | 5616 |
| **Number of time slots** | **Transmission group** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bit (FEC)**  **bit** |
| 20 | 8 | 8064 | 5760 |
| 21 | 8 | 8576 | 6144 |
| 22 | 8 | 9088 | 6528 |
| 23 | 9 | 9328 | 6672 |
| 24 | 9 | 9840 | 7056 |
| 25 | 9 | 10352 | 7440 |
| 26 | 10 | 10592 | 7584 |
| 27 | 10 | 11104 | 7968 |
| 28 | 10 | 11616 | 8352 |
| 29 | 11 | 11856 | 8496 |
| 30 | 11 | 12368 | 8880 |
| 31 | 11 | 12880 | 9264 |
| 32 | 12 | 13120 | 9408 |
| 33 | 12 | 13632 | 9792 |
| 34 | 12 | 14144 | 10176 |
| 35 | 13 | 14384 | 10320 |
| 36 | 13 | 14896 | 10704 |
| 37 | 13 | 15408 | 11088 |
| 38 | 14 | 15648 | 11232 |
| 39 | 14 | 16160 | 11616 |
| 40 | 14 | 16672 | 12000 |
| 41 | 15 | 16912 | 12144 |
| 42 | 15 | 17424 | 12528 |
| 43 | 15 | 17936 | 12912 |

*TABLE 3*

*Correspondence between the number of slots and the maximum number of binary bits for broadcast messages (VDE-ASM Message 2)*

|  |  |  |
| --- | --- | --- |
| **Number of time slots** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bits (FEC)**  **bit** |
| 1 | 280 | 184 |
| 2 | 792 | 568 |
| 3 | 1304 | 952 |

*TABLE 4*

*Correspondence between the number of slots and the maximum number of binary bits for reservation addressing messages (VDE-ASM Message 3)*

|  |  |  |  |
| --- | --- | --- | --- |
| **Number of time slots** | **Transmission group** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bit (FEC)**  **bit** |
| 1 | 1 | 208 | 112 |
| 2 | 2 | 416 | 224 |
| 3 | 2 | 928 | 608 |
| 4 | 2 | 1440 | 992 |
| 5 | 3 | 1648 | 1104 |
| 6 | 3 | 2160 | 1488 |
| 7 | 3 | 2672 | 1872 |
| 8 | 4 | 2880 | 1984 |
| 9 | 4 | 3392 | 2368 |
| 10 | 4 | 3904 | 2752 |
| 11 | 5 | 4112 | 2864 |
| 12 | 5 | 4624 | 3248 |
| 13 | 5 | 5136 | 3632 |
| 14 | 6 | 5344 | 3744 |
| 15 | 6 | 5856 | 4128 |
| 16 | 6 | 6368 | 4512 |
| 17 | 7 | 6576 | 4624 |
| 18 | 7 | 7088 | 5008 |
| 19 | 7 | 7600 | 5392 |
| 20 | 8 | 7808 | 5504 |
| 21 | 8 | 8320 | 5888 |
| 22 | 8 | 8832 | 6272 |
| 23 | 9 | 9040 | 6384 |
| 24 | 9 | 9552 | 6768 |
| 25 | 9 | 10064 | 7152 |
| 26 | 10 | 10272 | 7264 |
| 27 | 10 | 10784 | 7648 |
| 28 | 10 | 11296 | 8032 |
| 29 | 11 | 11504 | 8144 |
| 30 | 11 | 12016 | 8528 |
| 31 | 11 | 12528 | 8912 |
| 32 | 12 | 12736 | 9024 |
| **Number of time slots** | **Transmission group** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bit (FEC)**  **bit** |
| 33 | 12 | 13248 | 9408 |
| 34 | 12 | 13760 | 9792 |
| 35 | 13 | 13968 | 9904 |
| 36 | 13 | 14480 | 10288 |
| 37 | 13 | 14992 | 10672 |
| 38 | 14 | 15200 | 10784 |
| 39 | 14 | 15712 | 11168 |
| 40 | 14 | 16224 | 11552 |
| 41 | 15 | 16432 | 11664 |
| 42 | 15 | 16944 | 12048 |
| 43 | 15 | 17456 | 12432 |

*Table 5*

*Correspondence between the number of slots and the maximum number of binary bits for addressing messages (VDE-ASM message 4)*

|  |  |  |
| --- | --- | --- |
| **Number of time slots** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bit (FEC)**  **bit** |
| 1 | 248 | 152 |
| 2 | 760 | 536 |
| 3 | 1272 | 920 |

*Table 6*

*Correspondence between the number of slots and the maximum number of binary bits for geographic multi-broadcast messages (VDE-ASM message 6)*

|  |  |  |
| --- | --- | --- |
| **Number of time slots** | **Maximum binary data bits (without FEC)**  **bit** | **Maximum Binary Data Bits (FEC)**  **bit** |
| 1 | 208 | 112 |
| 2 | 720 | 496 |
| 3 | 1232 | 880 |

*Table 7*

*Correspondence between the number of slots and the maximum number of binary bits for addressed messages (AIS message 6)*

|  |  |
| --- | --- |
| **Number of slots** | **Maximum Binary Data Bits** |
| 1 | 48 |
| 2 | 272 |
| **Number of slots** | **Maximum Binary Data Bits** |
| 3 | 496 |
| 4 | 720 |
| 5 | 920 |

*Table 8*

*Corresponding relationship between the number of slots for scheduled broadcast messages (AIS message 8) and the maximum number of binary bits*

|  |  |
| --- | --- |
| **Number of slots** | **Maximum Binary Data Bits** |
| 1 | 80 |
| 2 | 304 |
| 3 | 528 |
| 4 | 752 |
| 5 | 952 |

### analysis of adaptation between ais messages and vde-asm messages in IMO SN.1/CIRC 289

According to the definition of ASM in IMO.SN.1/Circ.289, its compatibility with AIS messages and VDE-ASM messages is shown in Table 9.

*Table 9*

*Adaptation between AIS Messages and VDE-ASM Messages in IMO SN.1/Circ 289*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **DAC** | **FI** | **Application-Specific Messages type** | **AIS 6** | **AIS 8** | **ASM 1** | **ASM 2** | **ASM 3** | **ASM 4** | **ASM 6** |
| 001 | 16 | Number of persons on board | Support | Not support | Not support | Not support | Support | Support | Not support |
| 001 | 17 | VTS-generated/  synthetic targets | Not support | Support | Support | Support | Not support | Not support | Support |
| 001 | 18 | Clearance time to enter port | Support | Not support | Not support | Not support | Support | Support | Not support |
| 001 | 19 | Marine traffic signal | Not support | Support | Support | Support | Not support | Not support | Support |
| 001 | 20 | Berthing data | Support | Not support | Not support | Not support | Support | Support | Not support |
| **DAC** | **FI** | **Application-Specific Messages type** | **AIS 6** | **AIS 8** | **ASM 1** | **ASM 2** | **ASM 3** | **ASM 4** | **ASM 6** |
| 001 | 21 | Weather observation report from ship | Not support | Support | Support | Support | Not support | Not support | Not support |
| 001 | 22 | Area notice – broadcast | Not support | Support | Support | Support | Not support | Not support | Support |
| 001 | 23 | Area notice – addressed | Support | Not support | Not support | Not support | Support | Support | Not support |
| 001 | 24 | Extended ship static and voyage-related  data | Not support | Support | Support | Support | Not support | Not support | Not support |
| 001 | 25 | Dangerous cargo indication | Support | Not support | Not support | Not support | Support | Support | Not support |
| 001 | 26 | Environmental | Not support | Support | Support | Support | Not support | Not support | Not support |
| 001 | 27 | Route information – broadcast | Not support | Support | Support | Support | Not support | Not support | Support |
| 001 | 28 | Route information – addressed | Support | Not support | Not support | Not support | Support | Support | Not support |
| 001 | 29 | Text description – broadcast | Not support | Support | Support | Support | Not support | Not support | Support |
| 001 | 30 | Text description – addressed | Support | Not support | Not support | Not support | Support | Support | Not support |
| 001 | 31 | Meteorological and Hydrographic data | Not support | Support | Support | Support | Not support | Not support | Support |
| 001 | 32 | Tidal window | Support | Not support | Not support | Not support | Support | Support | Not support |

### IMO SN.1/CIRC 289 information and vde-asm message adaptation definition

Taking the hydro-meteorological information in IMO SN.1/Circ 289 as an example, explain the adaptation process of its data field content to the VDE-ASM message, as shown in Table 10.

*Table 10*

*Example of Hydro-Meteorological Information Adaptation with VDE-ASM Message*

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Number of bits** | **Description** |
| IAI | 16 | DAC：001，FI：31 |
| Longitude#1 | 25 | Longitude in 1/1,000 min, ±180 degrees as per 2's complement  (East = positive, West = negative).  181 = not available = default |
| Latitude#1 | 24 | Latitude in 1/1,000 min, ±90 degrees as per 2's complement  (North = positive, South = negative).  91 = not available = default |
| Position accuracy#1 | 1 | 1 = high (<10 m; Differential Mode of, e.g., DGNSS receiver)  0 = low (>10 m; Autonomous Mode of, e.g., GNSS receiver or of  other electronic position fixing device)  default = 0 |
| Time stamp#1 |  | UTC time and date of the data |
| UTC day#1 | 5 | 1 - 31  0 = not available = default |
| UTC hour#1 | 5 | 0 - 23  24 = not available = default |
| UTC minute#1 | 6 | 0 - 59  60 = not available = default |
| Average wind speed#1#1 | 7 | Average of wind speed values for the last 10 minutes,  in 1 knot steps.  0 - 125 knots  126 = wind 126 knots or greater  127 = not available = default |
| Wind Gust  #1 | 7 | Maximum wind speed reading during the last 10 minutes,  in 1 knot steps.  0 - 125 knots  126 = wind 126 knots or greater  127 = not available = default |
| Wind direction#1 | 9 | Direction of the average wind during the last 10 minutes,  in 1 degree steps.  0 - 359 degrees  360 = not available = default  361 - 511 (reserved for future use) |
| Wind Gust Direction  #1 | 9 | Direction of the maximum wind during the last 10 minutes,  in 1 degree steps.  0 - 359 degrees  360 = not available = default  361 - 511 (not for use) |
| Air  Temperature#1 | 11 | Dry bulb temperature in degrees Celsius (as per 2's  complement), in 0.1 degree steps.  -60 to +60 degrees Celsius  601 - 1,023 (reserved for future use)  -1,024 = data not available = default  -1,023 to -601 (reserved for future use) |
| Relative Humidity#1 | 7 | Relative Humidity, in 1% steps.  0 - 100%  101 = not available = default  102 -127 (reserved for future use) |
| **Parameter** | **Number of bits** | **Description** |
| Dew point#1 | 10 | Dew point temperature in degrees Celsius (as per 2's  complement), in 0.1 degree steps.  -20.0 to +50.0 degrees  501 = not available = default  502 - 511 (reserved for future use)  -511 to -201 (reserved for future use) |
| Air Pressure  #1 | 9 | Air pressure, defined as pressure reduced to sea level,  in 1 hPa steps.  0 = pressure 799 hPa or less  1 - 401 = 800 - 1200 hPa  402 = pressure 1201 hPa or greater  403 - 510 (reserved for future use)  511 = not available = default |
| Air Pressure Tendency  #1 | 2 | 0 = steady  1 = decreasing  2 = increasing  3 = not available = default |
| Horizontal Visibility  #1 | 8 | Horizontal visibility, in 0.1 Nautical Miles steps (00000000  to 01111111).  0.0 - 12.6 Nautical Miles  The most significant bit (MSB) indicates that the maximum range  of the visibility equipment was reached and the reading shall be  regarded as > x.x NM. (e.g., if 10110010, then visibility is 5.0 NM  or greater)  127 = data not available = default |
| Water level (incl. tide#1) | 12 | Deviation from local chart datum, in 0.01 metre steps.  -10.0 to +30.0 metres  A value representing 0 - 4,000 is sent by the 12 binary bits. The  water level is achieved by adding -10.0 to the sent value.  Water level = (Integer value /100) – 10 for Integer =  0-4,000  4,001 = not available = default  4,002 – 4,095 (reserved for future use) |
| Water Level Trend#1 | 2 | 0 = steady  1 = decreasing  2 = increasing  3 = not available = default |
| Surface Current Speed (incl.  tide) #1 | 8 | Speed of Current measured at the sea surface, in 0.1 knot steps.  0.0 - 25.0 knots  251 = speed 25.1 knots or greater  255 = not available = default  252-254 (reserved for future use) |
| Surface Current Direction #1 | 9 | Direction of Current at the sea surface, in 1 degree steps.  0 - 359 degrees  360 = not available = default  361 - 511 (reserved for future use) |
| **Parameter** | **Number of bits** | **Description** |
| Current Speed, #2 #1 | 8 | Speed of Current 2 measured at a chosen level below the sea  surface, in 0.1 knot steps.  0.0 - 25.0 metres  251 = height 25.1 metres or greater  255 = data not available = default  252 - 254 (reserved for future use) |
| Current Direction, #2 #1 | 9 | Direction of Current 2, in 1 degree steps.  0 - 359 degrees  360 = data not available = default  361 - 511 (reserved for future use) |
| Current Measuring level, #2 #1 | 5 | Measuring level below sea surface, in 1 metre steps.  0 - 30 metres  31 = data not available = default |
| Current Speed, #3 #1 | 8 | Height of the waves, in 0.1 metre steps.  0.0 - 25.0 metres  251 = height 25.1 metres or greater  255 = data not available = default  252 - 254 (reserved for future use) |
| Current Direction, #3 #1 | 9 | Direction of Current 3, in 1 degree steps.  0 - 359 degrees  360 = data not available = default  361 - 511 (reserved for future use) |
| Current Measuring level, #3 #1 | 5 | Measuring level below sea surface, in 1 metre steps.  0 - 30 metres  31 = data not available = default |
| Significant Wave Height #1 | 8 | Height of the waves, in 0.1 metre steps.  0.0 - 25.0 metres  251 = height 25.1 metres or greater  255 = data not available = default  252 - 254 (reserved for future use) |
| Wave Period #1 | 6 | Wave period, in 1 second steps.  0 - 60 seconds  61 - 62 (reserved for future use)  63 = not available = default |
| Wave Direction  #1 | 9 | Direction of waves, in 1 degree steps.  0 - 359 degrees  360 = data not available = default  361 - 511 (reserved for future use) |
| Swell Height  #1 | 8 | Height of the swell, in 0.1 metre steps.  0.0 - 25.0 metres  251 = height 25.1 metres or greater  255 = data not available = default  252 - 254 (reserved for future use) |
| Swell Period  #1 | 6 | Swell period, in 1 second steps.  0 - 60 seconds  61 - 62 (reserved for future use)  63 = not available = default |
| Swell Direction  #1 | 9 | Direction of swells, in 1 degree steps.  0 - 359 degrees  360 = not available = default  361 - 511 (reserved for future use) |
| **Parameter** | **Number of bits** | **Description** |
| Sea State  #1 | 4 | Beaufort Scale, as defined in Table 1.2 |
| Water Temperature  #1 | 10 | Temperature of the water in degrees Celsius (as per 2's  complement), in 0.1 degree steps.  -10.0 to +50.0 degrees  501 = data not available = default  502 - 511 (reserved for future use)  -511 to -101 (reserved for future use) |
| Precipitation (type) #1 | 3 | According to WMO 306 Code table 4.201:  0 = reserved  1 = rain  2 = thunderstorm  3 = freezing rain  4 = mixed/ice  5 = snow  6 = reserved  7 = not available = default |
| Salinity #1 | 9 | Salinity, in 0.1‰ (ppt) steps.  0.0 - 50.0 ‰  50.1 = salinity 50.1 ‰ or greater  510 = not available = default  511 = sensor not available  502 - 509 (reserved for future use) |
| Ice #1 | 2 | 0 = No  1 = Yes  2 = (reserved for future use)  3 = not available = default |
| Spare | 10 | Not used. Set to zero |
| Total | 304（n=1） | 10+294n（n=1、2...） |

In Table 10, the symbol “#” represents the ability to perform multiple cycles of broadcasting, #num represents the iteration number, and the total bit count includes 10 bits for non-cyclic parameters (which are transmitted only once per message broadcast) and 294 bits for cyclic parameters needed for each cycle. The hydro-meteorological information is only suitable for broadcasting in AIS message 8 and ASM 1, ASM 2, ASM 6. Based on the maximum binary data bit count in each type of message, the information in Table 10 can be broadcast in different cycles. The message types and cycle times are shown in Table 11.

*Table 11*

*Frequency of Hydro-meteorological Information in Corresponding Broadcast Message Types*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Broadcast message** | **AIS 8** | **ASM 1（FEC/****without FEC）** | **ASM 2（FEC/without FEC）** | **ASM 6（FEC/without FEC）** |
| Cycle (times) | 1 | 60/43 | 4/3 | 4/2 |

# References

1. IMO SN.1/Circ.289, Guidance on the use of AIS Application-Specific Messages, June 2010
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

# Action requested of the Committee

The Committee is requested to consider to establish a subtask to revise SN.1/Circ.289 within the 2023-2027 mission "Harmonized implementation of Application Specific Message (ASM)" and invite IALA members to provide input on it.