Baltic Marine Environment Protection Commission

Expert Working Group for Mutual Exchange and Deliveries of AIS & Data
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Background

The HELCOM Recommendation 33/1 describes the interface used for exchanging the AIS data between HELCOM Parties. The interface description has remained almost unchanged from the beginning of the HELCOM AIS co-operation.

The AIS data interface, which each Party has to provide, consist of a TCP/IP socket (defined by fixed IP address and port number) and data stream via the TCP/IP socket. The format of the data stream is required to follow the IEC standard IEC 61162-1 (*Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners*). This standard has been developed to support one-way serial data transmissions from a single talker to one or multiple listeners and it includes the description of sentence structures that should be used.

All the IEC 61162 series standards have originally been developed to support communication between bridge equipment. After the first standard (IEC 61162-1) other standards of the same series have emerged to support other transmission types. The latest standard IEC 61162-450 (*Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 450: Multiple talkers and multiple listeners - Ethernet interconnection*) supports data transmissions on Ethernet network and provides an enhanced sentence structure which might be of interest to HELCOM Parties.

Action requested

The Meeting is invited to take note of the information provided in the document.

AIS data format - IEC standard 61162-450 for Ethernet interconnections

When the HELCOM Expert Working Group on mutual exchange and deliveries of AIS data (AIS EWG) was established, one of the very first tasks of group was to agree on the technical interface specification for the exchange of AIS data.

The group agreed to re-use the already existing standards. It was agreed that the connection type would be TCP/IP socket and the data format would follow the IEC 61162-1 standard (earlier published as IEC/PAS 61162-100 and IEC/PAS 61162-101).

1. Current AIS data format using IEC 61162-1 sentences

The IEC 61162-1 standard defines a set of different sentence types, which can be used to interface bridge equipment for configuring, receiving sensor information etc. It defines a special sentence structure for conveying information, which needs greater bandwidth. This sentence type is called encapsulation sentence and it is the one that is used to transfer AIS data received via the VHF datalink. This particular sentence structure was chosen to be used for the HELCOM AIS data exchange. The general structure of an encapsulation sentence is shown and explained below.

!aaccc,x_1,x_2,x_3,c--c,x_4*hh<CR><LF>

where
"!" = start of a sentence containing encapsulated data
aaccc = address field; aa defining the type of talker and ccc defining the type of message
"," = field delimiter
x_1 = total number of sentences
x_2 = sentence number
x_3 = sequential message identifier
c--c = data block; in addition to encapsulated data it may also contain parameter fields
x_4 = number of fill-bits (inside the encapsulated message)
"*" = checksum delimiter
hh = checksum
<CR><LF> = end of sentence

In case of AIS data the data block field (marked as c--c above) contains:

- parameter field with AIS channel information (A or B)
- encapsulated ITU-R M.1371 radio message

Some examples of encapsulation sentences carrying AIS data are given below.

!BSVDM,1,1,,A,3Cu>2;002nQHiO`R=23BTB3F00Uh,0*7C
!BSVDM,1,1,,B,1D80CB003HQi5WPR7l;PnhgD8@Ip,0*37
!BSVDM,2,1,3,A,5CLBG7T28eodt`4V2205E86222222222222220t3HK8440Ht;BCRCp88888,0*1E
!BSVDM,2,2,3,A,88888888880,2*3E

2. Additional information provided by standard IEC 61162-450

The currently used data format, which is explained in the previous chapter, does not provide time stamp or information on the originator of the data. However, both of these could be added to the original IEC 61162-1 sentence using the more resent IEC 61162-450 standard. This standard provides a mechanism to transmit the IEC 61162-1 sentences in a network environment from multiple talkers to multiple listeners.

IEC 61162-450 defines a protocol where a so-called TAG (Transport, Annotate, and Group) Block is added in front of the original IEC 61162-1 sentence. The TAG block can carry additional information related to the sentence. The general structure of the TAG block is shown and explained below:

$\p_1:y_1,p_2:y_2,\ldots,p_n:y_n*hh\$

where
"\" = begin and/or end TAG block delimiter
p_1 = first parameter code
":" = code delimiter
y_1 = value of the first parameter
"," = parameter field delimiter
p_2 = second parameter code
y_2 = value of the second parameter
… = other parameter codes and values as required
p_n = last parameter code
p_n = value of the last parameter
"*" = checksum delimiter
hh = checksum

The available TAG block parameter codes are:

"c", UNIX time (cumulative seconds from Jan 1st 1970, 00:00:00 UTC)
"d", Destination identification
"g", Sentence grouping
"n", Line count
"r", Relative time
"s", Source identification
"t", Free text
"a", General authentication

Some examples of original IEC 61162-1 sentences with added TAG blocks are given below (Unix time is in given milliseconds in this example).

\s:002300000,c:1558090544462*hh\!BSVDM,1,1,,A,3Cu>2;002nQHiO`R=23BTB3F00Uh,0*7C
\s:002300000,c:1558090544462*hh\!BSVDM,1,1,,B,1D80CB003HQi5WPR7l;PnhgD8@Ip,0*37
\s:002300000,c:1558090544515*hh\!BSVDM,2,1,3,A,5CLBG7T28eodt`4V2205E8622222222222222220t3HK8440Ht;BCRCp88888,0*1E
\s:002300000,c:1558090544515*hh\!BSVDM,2,2,3,A,88888888880,2*3E

It is possible to add more than one TAG block to one IEC 61162-1 sentence. In such a case, the new TAG block must be added between the already existing TAG block and the original IEC 61162-1 sentence.

3. Benefits of updating the HELCOM AIS data format From IEC 61162-1 to IEC 61162-450

The current historical AIS data stored by Norway to the HELCOM ftp server already uses TAG blocks. An example of the stored data is given below (Unix time is given in seconds in this example).

\s:ASM//Port=1//MMSI=,c:1555459201*7E\!BSVDM,1,1,,A,13mI6E7P00PsWQrVn;sN4?v020RL,0*35
\s:ASM//Port=1//MMSI=,c:1555459201*7E\!BSVDM,2,1,0,A,53om9B400000h<u@00184pT0000000000000001?0hG0756n?7UQDS0CQ1,0*4C
\s:ASM//Port=1//MMSI=,c:1555459201*7E\!BSVDM,2,2,0,A,E;@QDQiCP0000,0*0F

In case of HELCOM data, Norway (listener) is adding TAG blocks to the sentences. However, the quality of the data might be increased if the TAG blocks would be added to the sentences already by the national AIS system providing the data (talker).

If the national system would add the TAG block, the time stamp and information on the originator of the data would become an integral part of the exchanged sentences and could help to handle for example situations when data need to be buffered for retransmission.

The most relevant TAG block parameter codes that could be added to HELCOM AIS data would be the ones that are already deployed by Norway in the HELCOM database, namely parameter code "c" (Unix time) and parameter code "s" (Source identification). In case there would be need to authenticate the transmissions, an additional parameter code "a" (General authentication) could be used.

Refrences:

HELCOM ftp-server; https://aisftp.kystverket.no/

HELCOM Recommendation 33/1

IEC 61162-1; Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners

IEC 61162-450; Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 450: Multiple talkers and multiple listeners - Ethernet interconnection