European Maritime Safety Agency

SafeSeaNet Streaming Interface (SSN-SI) Interface Control Document

History

Version	Prepared	Approved	date	Reason
0.1	Oscar RODRIGUEZ VILLAAMIL (EMSA)		2012-05-23	Initial draft
0.2	Intrasoft-Intl Specs team		2012-05-25	Commented initial draft.
0.3	Intrasoft-Intl Specs team		2012-06-05	Incorporated comments from EMSA, CLS and II.
1.0	Intrasoft-Intl Specs team		2012-06-07	1st official release.
1.10	Intrasoft-Intl Specs team		2012-07-17	Update section 4 element <I> definition.
1.20	Intrasoft-Intl Specs team		2012-07-23	
1.30	Intrasoft-Intl Specs team		2013-02-01	Updated the xsd annotations, fixed participant value pattern, fixed the <Q> value pattern Updated the Ship Type table
1.40	Intrasoft-Intl Specs team		2013-02-28	Updated element S

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1. Introduction

1.1. SCOPE

This document specifies the streaming interface of SSN (SSN-SI). Furthermore it describes the usage of the "comment block" extensions as defined in the IEC 62320-1 standard.

Moreover this includes the needed information to appropriately interface the SSN-SI to the national applications installed at the Member States (MS) premises.

This document shall be a living document: it will evolve during the development according to working experience and unforeseen issues.

1.2. OVERVIEW

The STIRES system, one of the applications included currently in the SSN v.2 system, is conceived as an enhancement to the SSN system for facilitating relaying and exchanging information between the EU Member States, Norway and Iceland. STIRES is used to relay to participating countries, the full near-real-time AIS information picture enhanced with selected data stored in the SSN European Index Server (SSN-EIS) as well as data received by other existing or planned systems.

Three Regional Systems (RS) already existed in the European Union before the STIRES was designed: the HELCOM covering the Baltic Sea, the North Sea and the Mediterranean Sea (now renamed MARES and indicated with MARES for simplicity in the following sections). All three RS have established the exchange of AIS data between the MSs for the whole of their corresponding areas. It was therefore decided (during the initial design phase of STIRES in 2008), to take advantage of this and interface STIRES to the three RS in order for them to collect the AIS data provided by the MS instead of establishing new interfaces directly to each MS. A software application, currently called National Proxy (NPR) was developed to facilitate the connection between RS and the STIRES server. The proxies must be installed at the Regional premises (typically in a redundant configuration) and manages the secure connection which allows the RS and the STIRES to exchange AIS data.

The standard IEC 61162 protocol was simply adapted for the exchange of AIS data between the RS and STIRES because of the already wide utilization (with all 3 RS in common, already complying with the IEC 61162). However, the IEC 61162 standard, which was primarily designed for on-board AIS equipment, has some serious drawbacks and limitations when used in complex environments like SSN. For this reason, the STIRES core module (COR) and the proxy are both supporting the Comment Block (CB) extension as defined in the **IEC 62320-1 standard**, which provides for the AIS Base Stations interface. In particular, CBs are already used in SSN to extend the content of the standard IEC 61162 AIS messages with complete timestamp information (only partially complete when transmitted by ships).

The experience from the use of NPRs within the STIRES architecture during the period that followed its launch, revealed that comment blocks could be used to expand further the usage of the NPR as an interface with Regional servers and Member States to improve the

monitoring of the reception/ distribution streams; this would facilitate the exchange of position messages originated from systems other than terrestrial AIS (e.g. Satellite AIS, VMS, etc). Furthermore, recent developments in the AIS standardisation field (altering the use of some fields in messages 1, 2 and 3) as well as an assessment on the consequences of recent decisions of IMO (reference is made to SN.1/ Circ.289 -2/6/2010 providing guidance on the use of AIS application-specific messages) calls for an evolution to the proxy application towards a more open and future-proof design approach.

The term "STIRES NPR" is replaced with "SSN-SI" (SafeSeaNet Streaming Interface).

1.3. DOCUMENT ORGANIZATION

1.4. REFERENCE DOCUMENTS

Ref	Document	Ed	Issue Date	Title
R1	IEC61162-1	3.0	2007-04	Maritime navigation and radiocommunication equipment and systems – Digital interfaces
R2	IEC 62320-1	1.1	2009-05	Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS)

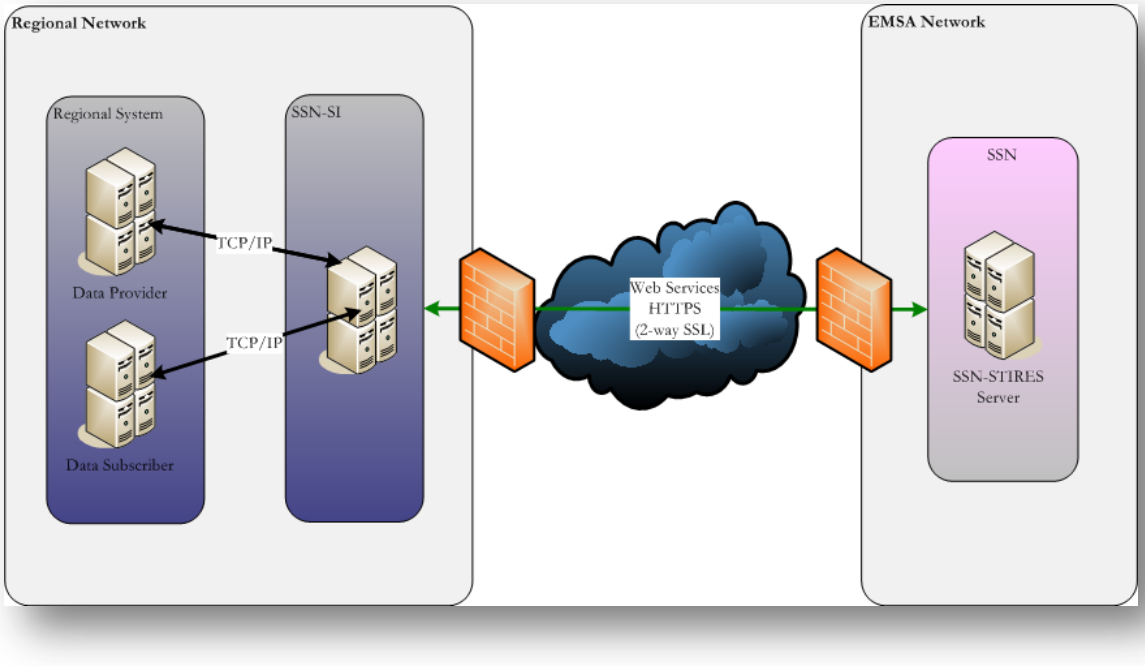
1.5. DEFINITIONS, ABBREVIATIONS AND ACRONYMS

Abbreviation	Definition
AIS	Automatic Identification Systems
CB	Comment block
EMSA	European Maritime Safety Agency
IMO	International Maritime Organisation
ISO	International Organization for Standardization
ITU	International Telecommunications Commission
ITU_1	AIS Message Type 1 AIS Vessel position report using SOTDMA (Self-Organizing Time Division Multiple Access). This is the most common AIS message type.
ITU_3	AIS Message Type 3 AIS Vessel position report using ITDMA (Incremental Time Division Multiple Access).
ITU_5	AIS Message Type 5 Ship static and voyage related data. This is the third-most common AIS message type. Due to its length it is generally a 2-part message.
MMSI	Maritime Mobile Service Identity
N/A	Not Applicable or Not Available
NAF	North Atlantic Format
NPR	National Proxy
SSN SI	SafeSeaNet Streaming Interface
URL	Unified Resource Locator
WADL	Web Application Description Language. It describes XML over HTTP interfaces
XML	eXtensible Markup Language

2. Interface description

SSN_SI acts as proxy at the national or regional level so to distribute AIS data to IMDaTe.

The interface supports IEC format messages that comply with the IEC 61162 format []. The supported communication protocol for the transmission of the IEC messages is TCP/IP.



The connection with the data provider shall be an unencrypted raw TCP/IP (socket) connection.

The SSN-SI shall be able to act both as client and as server in order to facilitate the connection with the AIS data Providers and Subscribers.

The SSN-SI Provider Connection mode can be configured as either:

- Server mode: SSN-SI accepts connection requests from multiple Data Providers - if IP filter is enabled, SSN-SI accepts only connection requests from a set of allowed IP addresses
- Client mode: SSN-SI connects to Data Providers;
- Both (client and server) active at the same time.

The SSN-SI Subscriber Connection mode can be configured as either:

- Server mode- SSN-SI accepts connection requests from multiple Subscribers - if IP filter is enabled, SSN-SI accepts only connection requests from a set of allowed IP addresses;
- Client mode: SSN-SI connects to Subscribers;
- Both (client and server) active at the same time.

2.1. USE OF COMMENT BLOCKS

SSN-SI uses the Comment Block (CB) extension to the IEC 61162 standard to exchange AIS data together with additional information such as complete timestamp, configuration and status messages.

The main advantages of the CB extension are:

- transparency: data providers and recipients who do not support CBs will still be able to send and receive messages in IEC 61162 format while data providers and recipients who implement CBs will be able to send and/or receive the additional information embedded in CBs;
- standardization: CBs are defined in the IEC 62320-1 standard for AIS Base Stations and are very likely to become a widely used extension to the IEC 61162 protocol.

A CB line is typically a list of parameter code and value pairs between backslash characters ('\') preceding the related IEC 61162 sentence:

\Parameter-code:value,…*hh\!AIVDM,…*hh<CR><LF>

CB lines can be grouped together extending the maximum length of a CB line (limited to 80 chars) and allowing for the linkage of multiple sentences. The IEC 62320-1 standard defines a dictionary of parameter codes:

- 'c': Time in seconds calculated from midnight January 1, 1970. This is a general time tag that can be attached to a line. Typically it is used to provide a complete timestamp with the AIS message.
- 'd': destination. Identification of intended listener device or process for the attached sentence.
- 's': source. Identification of the talker device or process for the attached sentence.
- 'i': information. This is freeform text using valid characters (see IEC 61162-1, Table 2).
- x: (lower case "X") counter. This value is incremented by 1 for each occurrence of the parameter-code being used in a line generated by a talker [source].
- xGy: coding used to link lines into a group. The required parameters are: sentence number, total number of sentences, and sequential identifier.

The parameter 'c' is used by SSN-SI to extend the AIS messages with complete time information. Parameters 'd' and 's' are primarily intended to identify talker IDs of software processes and hardware devices. Parameters 'x' and 'xGy' have also a well-defined behaviour.

Instead, the parameter 'i' can be freely used to transparently embed additional information to the message. Therefore, the proposal drawn in this chapter (and further detailed in the following chapters) exploits the information parameter to extend the AIS message with the required information (as described in the previous chapter). The following issues have been considered to decide the format of additional data inside the information field:

1. Bandwidth requirements should be a concern as several tens of messages per second are already being delivered to each proxy and the maximum length for a CB line set a limitation which may be only partially overcome using CB groups. For these reasons, the information should be concise.
2. A human readable format allows software applications already complying to the IEC 62320-1 standard to display the information as it is, providing basic but useful indications to the user.
3. A machine readable format easily allows enhanced applications to make full use of the additional information, applying relevant access policies, displaying proper symbols depending on sensor source and/or enrichment data, etc.
4. Wherever possible, only valid characters as defined in the IEC 61162 should be used.

As a consequence, the data format to be proposed by the contractor for the additional information must be a simple, stripped-down XML format, which respects the above requirements while still providing the right degree of expandability.

As presented below, a number of tags must be defined to associate information on the sensor type, originator, recipients, and quality of transmitted position, enrichment and port of destination related to the linked AIS or (synthetic) AIS message emulating position tracks provided via other sensors.

The parameter code ‘i’ shall contain an XML document following the XML schema defined in 0.

The message should not contain the enclosing root element (<i>). Therefore, receiving application should add it for validation purposes.

The XML sentence can be cut any point in order to respect the string length limitations imposed by the IEC62320-1 specifications. Hence the XML document will be cut into lines respecting the standard limitation in terms of maximum number characters per comment block and sentence linking.

It should be noted that that the maximum number of CB lines composing a CB group is limited to 10.

The repetition (or not) of the “i:” code in each CB line is not clarified in the standards (IEC62320-1 and IEC61162-1); however in the current interface specification it is required to repeat it in each line in order each line to be a valid comment block sentence by it’ s own.

3. Constraints

The non-functional requirements relative to the SSN-SI processing are addressed as following:

- Availability shall ensure the system is functioning in order to accept and provide data based on the SLA specified in section 0 of this document.
- Performance:
- SSN-SI guarantees the reception and processin of messages up to
    - an average rate of 100 messages per second.
    - a maximum peak rate of 200 messages per second over a maximum time period of 10 minutes
    - A single message is counted as the AIS message including its associated comment block
    -
- Susbscriber systems of SSN-SI data shall be able to receive data at equivalent rates (depending on the data they subscribe to).The system shall distribute data with a average delay of 10 secondsfrom the time the SSN-SI receives a AIS message until the same message is made available to a subscriber via the SSN-SI .
- Integrity: the ratio of messages lost or corrupted in message transfer between the Regional server(s) /Member States and SSN-SI shall be less than 0.1%. SSN-SI will retry (configurable number of retries and interval between retries) message transmission in case of subscriber unavailability.

Service Level AgreementSSN-SI system design and implementation shall be is able to support the Service Level Objective (SLO):

- 95% availability of the time over any 24 hours period
- 99% availability over 1 month

4. CB 'i' XML element definition

Element	Type	Values	Definition
S	String Enumerated list to identify system generating the information (transponder on-board or terrestrial service – vessel detection systems, VTSs, other)	**A, L, R, V, S, F, O, M, T, I, G, Z, W, Y, J, B, C, E, H, X,** indicating respectively the values reported in Table 1	1. If tag S is not declared, the default value is A (T-AIS), considered as raw terrestrial AIS data 2. Tags A, L, R ,V, S, F, O, M, G, Z indicate position data as transmitted by each of the relevant sensors/systems as per Table 1 3. Tag T is used to indicate test data (e.g. simulated ship positions) 4. Tag V (VTS GENERATED) indicate that the source of the position could be any of those available at VTS site (Terrestrial AIS, Radar, both, etc) and validated by the VTS operator 5. Tags I, W, Y, J, B, C, E, H are declared to indicate position data which are result of correlation processes between transmitted ship positions and detected targets 6. In case of tag values I, W, Y, J, B, C, E, H the system used for the correlation process can be identified by appropriately identifying the data provider in tag O (originator). Should no value is quoted in tag O and either I, W, Y, J, B, C, E or H is declared in tag S, the data correlation is made at EMSA system level. 7. Data declaring as origin the source system "X" will be communicated to EMSA by external systems using the streaming interface. The value X shall be foreseen for future use in project specific scenarios (e.g. partner data)
Q	(Integer) 2 digit number (e.g. 24) Aiming at providing information on the data quality	First digit can take values 1 to 5, and the second digit can take the values 0 to 4	The first digit refers to the level of processing to which the data has been subjected to, before being sent through the proxy: 1: Position as sent by the sensor system and declared by tag S, values **A, L, R , V, S, F, O, M** 2: Position as sent by the sensor system and processed through correlation calculations, declared by tag S, values **I, W, Y, J, B, C, E, H** 3: Position is corrected or recovered based on auxiliary calculation or prediction (e.g. Doppler shift measurements, Kalman filtering, etc.) 4: Position is the result of a prediction algorithm (interpolated/extrapolated) 5: Position is the result of Doppler positioning calculations Second digit interpretation (quality of the position/ level of confidence): 0:Invalid Message 1:Poor 2:Good 3:Very good 4:Excellent Rules related to second digit : 1. 3 (very good) can be used only in combination with tag S values L, F. In case is used in combination with B, C, E or H, it means that the position data has been correlated with a position report that declared LRIT or VMS as source 2. 4 (excellent) can be used only in combination with tag S values M, V and X **General rule:** If tag Q is not included in a position transmission, the default value is either "**12**" (for tag S, values A, L, R, V, S, F, O, M) or value **"22"** (for

Element	Type	Values	Definition
			tag S, values T, I, Y, J, B, C, E, H, X)
O	String Aiming at providing information on the data originator	<O> RCC.SUB … .SUB</O>	The maximum number of Sub ID supported shall be 3. (RCC.SUB1.SUB2.SUB3) ***RCC*** Region or Country Code: 1-3 alphanumerical characters, • MID - Maritime Identification Digits (pure numbers), or • 3-Character ISO 3166-1 alpha-3 - used for countries, or • 2-Character ISO 3166-1 alpha-2 - used for countries • XAA to XZZ to denote regional or other systems – for instance: XHE (HELCOM), XNS (North Sea), XME (Mediterranean) Example: 219 means Denmark, 247 means Italy, ITA means Italy, IT means Italy. Certain MID have special meaning. The value 001 is often used for 'international' – i.e. all countries, 000 is often used for 'test'. ***SUB (optional)*** Sub Identifier**:** alphanumerical characters, specifying the actual originator of data within an RCC (e.g. a particular AIS base station, an SSN data provider, an IP address, etc.). There can be several sub identifiers if needed, separated by a dot, each identifying a lower level entity from left to right. No SUB identifier means data originates from the country / region without further specification. The SUB Id should be a code containing: • 3-Character ISO 3166-1 alpha-3 - used for countries, or • 2-Character ISO 3166-1 alpha-2 - used for countries, or • Sensor_system Id: 4-digit numerical code, or • Ports LOCODE: 5-digit (alphanumerical) code, or • MMSI Id: 9-digit number • IPv4 address Id: 8-digit (alphanumerical) code. Each couple of digit is the hexadecimal representation of one of the 4 fields of the IP address, or The FQDN corresponding to an IP or set of IP addresses If RCC='XZZ' then 2-10 characters. (case insensitive?). Examples (e.g ***(compan,org2***
R	String Aiming at providing information on a restricted set of recipients	<R> RCC1.SUB … .SUB RCC2.SUB … .SUB</R>	The maximum allowed number of recipients is 10. The maximum number of Sub ID supported shall be 3. ***RCC definition*** Region or Country Code: 1-3 alphanumerical characters, • MID - Maritime Identification Digits (pure numbers), or • 3-Character ISO 3166-1 alpha-3 - used for countries, or

Element	Type	Values	Definition
			• 2-Character ISO 3166-1 alpha-2 - used for countries • XAA to XZZ to denote regional or other systems – for instance: XHE (HELCOM), XNS (North Sea), XME (Mediterranean) Example: 219 means Denmark, 247 means Italy, ITA means Italy. Certain MID have special meaning. The value 001 is often used for 'international' – i.e. all countries, 000 is often used for 'test'. Codes containing letters could be used to denote regional or other systems – for instance: NS (North Sea), MED (Mediterranean, etc. More than one Recipients can be listed, separated by a ` ` (space). ***SUB*** Sub Identifier: alphanumerical characters, specifying the actual originator of data within an RCC (e.g. a particular AIS base station, an SSN data provider, an IP address, etc.). There can be several sub identifiers if needed, separated by a dot, each identifying a lower level entity from left to right. No SUB identifier means data originates from the country / region without further specification. The SUB Id should be a code containing: • 3-Character ISO 3166-1 alpha-3 - used for countries, or • 2-Character ISO 3166-1 alpha-2 - used for countries, or • Sensor_system_ Id: 4-digit numerical code, or • Ports LOCODE: 5-digit (alphanumerical) code, or • MMSI Id: 9-digit number, or • IPv4 address Id: 8-digit (alphanumerical) code. Each couple of digit is the hexadecimal representation of one of the 4 fields of the IP address, or Other types: *To Be Agreed after been defined by IMDateE*
U	(Integer) 2-digit number Aiming at providing information on the data usage policy	First can take values from 0 to 5. Second digit can take the values 1 or 2	First digit interpretation (transmitted data sensitivity): 0:Data could be made available to general public 1: Data to be disseminated to all authorised users according to their access rights 2: EU restricted data 3: EU confidential data 4: EU Secret data 5: EU Top secret data Rules related to first digit : ✓ Value 0 is not applicable for SSN ✓ Value 1 should be generally used for EMSA applications ✓ Values 2,3,4, 5 are supposed to be used if the sensor system declared in tag S is "X" Second digit interpretation (billing/charge system): 1:No-charge applicable 2:A charge is applicable for the specific as per system declared in

Element	Type	Values	Definition
			tag S policies Rules related to second digit : ✓ Value 2 can be declared only of the value declared in tag S is L or S . For tag S, values B, C, E and H, the condition is that the source system that provided the position was LRIT or S-AIS; commercial provider General rules: 1. If tag U is not included in a position transmission the default value is "**11**", (the position transmitted is available only to those with the appropriate access rights and is free of charge)
E	String	The string will include one or more values from those included in the Table 2.	To be used to specify the basic enrichment of the information. It should contain a string including the letters in Table 2 General rule: it is included only if the status in tag I is V (valid)
P	String	UNECE/ SSN specific or temporary LOCODE specified in the Operational location registry	Used to specify the Port of Call for the vessel's on-going voyage (as retrieved from a PortPlus or Port notification related to the ship's current voyage) **Rule** It is provided in order to identify the PortOfCall , of the currently active (on-going) ship voyage as registered by SSN 1. it is included only if the status in tag I is V (valid) 2. it is never provided if the speed of the vessel (actual or calculated is less than the threshold used for "idle" vessels) 3. it shall be included once following the detection (by means available at SSN central) of the departure of a ship from Last Port and / or following a notification that changes the Port of Call of the active voyage. In case a ZZCAN was received, ZZCAN will be transmitted as value of tag P.
L	String	UNECE/ SSN specific or temporary LOCODE specified in the Operational location registry	Used to specify the Last Port for the vessel (as retrieved from a PortPlus or Port notification related to the ship's current voyage) **Rule** 1. it is included only if the status in tag I is V (valid) 2. Tag L is never provided if the speed of the vessel (actual or calculated is less than the threshold used for "idle" vessels) 3. Tag L shall be included once following the detection (by means available at SSN central) of departure of a ship from Last Port
I	(String) Aiming at providing information on the ship main identifiers	Values (separated by a ' ' (space)) which will include the Status, IMO number, IR number, the MMSI, the Call Sign, the Ship type (according to the list of values in Table 3), flag and the ship's name Pattern in definition column for clarity	Used to specify the ship identifiers currently included in the SSN vessel registry (important to note that these identifiers are regularly checked against external sources). The following rules apply: 1. The string will have generally the following format Status <V or T or N>; IMO<7chars>; MMSI<9chars>; CallSign<UpTo7chars>; Type<3chars>; Flag<2chars>; IR< UpTo12chars>; Ship's Name <UpTo35chars> Pattern: (I:\d{7}($\|))?(M:\d{9}($|))?(C:\w{1,7}($\|))?(S:[VTN]($|))?(T:\d{3}($\|))?(F:[A-Za-z]{2}($|))?(R:[A-Za-z0-9]{1,12}($|))?(N:"[\w '\.-]{1,35}")? NOTE: Validation against this pattern is performed in application code because xsd does not have full support for regular expressions.

Element	Type	Values	Definition
			Example: <I>I:9332511 M:20145678 C:callsign S:V T:03 F:gr R:IrNumber N:"ship name"</I> Where I: is the prefix for the IMO value M: is the prefix for the MMSI value C: is the prefix for the Call Sign value S: is the prefix for the Status value T: is the prefix for the Type value F: is the prefix for the Flag value R: is the prefix for the IR Number value N: is the prefix for the Ship Name value 2. The ship's type correspond to the validated PSC type (see Table 3) **General Rule:** A. The possible values for the "Status" are V (valid), T (temporary) and N (non valid): – "Valid" is used if a vessel is stored within the SafeSeaNet OVR (operational vessel registry) and the ship particulars transmitted with the tag I are also included in the SSN reference vessel registry . In this case also e*nrichment data* (if available) will be included under tags E, P, L and I – "Temporary" is used if a vessel is not present within the RVR and it is only present in the OVR; In this case **no** enrichment *data* will be included under tags E, P, L and I and no ship particulars are to be quoted under tag I. – "Non valid" is used if the reported ship particulars are technically incorrect and/ or the combination of ship particulars quoted is – based on manual check from MSS operators - incorrect. In this case **no** e*nrichment data* will be included under tags E, P, L and I and no ship particulars are to be quoted under tag I B. the values of the valid identifiers, such as type and flag, shall be converted to short codes before being inserted, to shorten their name and save space – If the values of the valid identifiers correspond to the values carried in the raw message, the tag is not quoted – The values of the valid identifiers to be included within this tag are those missing (that were not reported in the raw message) and/or those that are different from the raw data – The flag particular (if inserted) identify the flag value as resulting from the validation process by SSN C. Ship Name – The Ship Name can have 0-35 characters. – Upon SOLAS, chapter I, part B, regulation 15 "Form Certificates", "the particulars inserted in the certificates shall be in Roman characters and Arabic figures". (From "A" to "Z" and from 0 to 9). Additional characters allowed are dots ".", dashes "-" and single apostrophe " ' ". D. Text values – All the text values should be inside double apostrophe " " " to avoid any ambiguity between blanks separators and blank character in a string. E.g. in the above example: <I>I:9332511 M:20145678 C:callsign S:V T:03 F:gr R:IrNumber N:"ship

Element	Type	Values	Definition
			name”</I> – All the text values should not contain the comma “,” character, as it is being used as a parameter separator in the comment block.
M	String	Values separated by a ` ’ (space) List of [KCD]:\d{5}(;\d{5})*	This value represents the method used to validate a position, by comparison or correlation with another observation (e.g. EO). The first letter is used to indicate the method used comparing/correlation the position : K: Kalman filtering C: correlation with EO D: Doppler Following the letters K-C or D, a 5-digit number represents in meters the distance between the observation / computed position and the original position. 99999 is used to indicate that the error is greater than 100 km. The data provider may validate the original positions using several methods. In this case, each method block is separated by a blank character: Example: <M>K:99999 C:99999 D:88888</M> In case of several checks, this pattern is repeated for each result check with “;” (semicolon) delimiter.* Examples: Invalid AIS message (AIS message that did not pass simple validity checks): \s:S,c:129301998,i:<O>XDP.AIS_Sat1</O><Q>10</Q>*XX\... Valid AIS message with no further enhancement: \s:S,c:129301998,i:<O>XDP.AIS_Sat1</O><Q>12</Q>*XX\... AIS position report correlated with EO data: \s:S,c:129301998,i:<O>XDP.AIS_Sat1</O><Q>12</Q><M>C:00450</M>*XX\...
N	(String) Iidentify predicted SAT-AIS messages and Doppler derived SAT-AIS messages	Pattern is [PD]\d{5}_\d{5}_\d{3}	This value characterizes the accuracy/reliability of a position computed with a prediction algorithm or Doppler shift measurements. The first letter is used to indicate the method used for the computation of the position : D: Doppler position P: Prediction Following the letters P-D, 3 fields separated by an underscore (_) define the uncertainty on the computed position described as an ellipse of error: • Fields 1 and 2 are respectively the semi major and semi minor axis expressed in meters. 99999 is used to indicate that the error is greater than 100 km • Field 3 is the inclination of the ellipse w.r.t. the geographic North. Examples: <N>P:1234_1243_000</N> for a predicted position <N>D:12345_1234_123</N> for a Doppler position • *AIS position report compared with Doppler location:* *\s:S,c:129301998,i:<O>XDP.AIS_Sat1</O><Q>12</Q><M>D:00250_12345_123</M>*XX\...* • *AIS position report reconstructed using data prediction:*

Element	Type	Values	Definition
			*\s:S,c:129301998,i:<O>XDP.AIS_Sat1</O><Q>21</Q><M>P01234_12345_123</M>*XX\...* • *AIS position report compared with Doppler location and invalidated because AIS and Doppler position do not match while the confidence on the Doppler position is high: \s:S,c:129301998,i:<O>XDP.AIS_Sat1</O><Q>10</Q><M>D:528000_99999_999</M>*XX\...*
T	String	Values separated by a ' ' (space) Pattern in definition column for clarity	Satellite AIS specific tag specifying: • groundStationAcquisitionTS: character A + timestamp number • dataCentreIngestionTS: character I + timestamp number • dataCentreDeliveryTS: character D + timestamp number • satelliteId: character L +string • groundstationId: character G + string Note: Spaces are used to separate each of the above values; no spaces allowed in string values of *satelliteId* and *groundstationId*. Pattern: (A:\d+($\|))?(I:\d+($|))?(D[0-5]?:\d+($\|))?(L:"[\w '\.-]+"($|))?(G:"[\w '\.-]+")? NOTE: Validation against this pattern is performed in application code because xsd does not have full support for regular expressions. Example: *<T>A:123456789 I:123456789 D:123456789 L:AIS-SAT1 G: "Svalbard-5"</T>*

Code	Source type	Description
A	T-AIS	Terrestrial AIS
L	LRIT	LRIT mandatory and pooled data
R	RADAR	Coastal or ship-borne radar-based vessel detection service
V	VTS	Coastal or port VTS data
S	S-AIS	Satellite AIS
F	VMS	Fisheries control – vessel monitoring service
O	VDS	Satellite-based vessel detection service
M	MRS	Mandatory reporting systems
T	TEST	Test purposes
I	T-AIS+VDS	Terrestrial AIS position correlated with satellite-detected target
G	SSN generated	SSN generated
Z	SSN generated +fusion	SSN generated +fusion
W	T-AIS+RADAR	Terrestrial AIS position correlated with coastal or ship-borne radar-detected target
Y	S-AIS+EO VDS	Satellite AIS position correlated with satellite-detected target
J	S-AIS+RADAR	Satellite AIS position correlated with coastal or ship-borne radar-detected target
B	LRIT+VDS	LRIT positions correlated with satellite-detected target
C	LRIT+RADAR	LRIT positions correlated with coastal or ship-borne radar-detected target
E	VMS+VDS	VMS positions correlated with satellite-detected target
H	VMS+RADAR	VMS positions correlated with coastal or ship-borne radar-detected target
X	"MILITARY"/ DEFENCE SYSTEM	e.g. partner data

Table 1 - Possible values of Tag S

Code	Description
A	Alert notification available
B	Banned vessel (from information made available to SSN central by Paris MoU)
D	Detained vessel (from THETIS data)
H	Hazmat notification available (from notifications provided by a MS)
S	Single Hull Tanker (from information at SSN level or from data in a PortPlus notification)
O	PSC-Ship Risk Profile – High Risk(from THETIS calculations)
T	PSC-Ship Risk Profile – Low Risk (from THETIS calculations)
R	PSC-Ship Risk Profile – Standard Risk (from THETIS calculations)
M	PSC-Priority of Inspection – Mandatory (from THETIS assessment)
P	PSC-Priority of Inspection – Optional (from THETIS assessment)
E	PSC-Eligible for an expanded inspection (from THETIS assessment)
N	PSC-Eligible to be banned at the next detention (from THETIS assessment)
K	Incident – SITREP
J	Incident – POLREP
Y	Incident – LFC
W	Incident – Waste
X	Incident – Pilot&PA_Reporting of anomalies
U	Incident – Banned ship under Paris MoU (banned status derived from an incident report sent by a MS)
V	Incident – VTS or Routeing system (e.g. TSS) infringement
Q	Incident – Ship underreporting
L	Incident – Results of inspection
I	Incident – Insurance failure
Z	Incident – Other incident presently not classified by the provider of the incident report

Table 2 - Possible values of Tag E

Code	Description	Code*	Description
311	NLS tanker	361	Refrigerated cargo
312	Combination carrier	367	Livestock carrier
313	Oil tanker	370	Ro-Ro passenger ship
315	Fishing vessel	371	Passenger ship
316	Warship and naval auxiliary	373	Fish factory
317	Wooden ship of a primitive build	375	Heavy load
318	Government ship used for non-commercial purpose	376	Offshore supply
319	Pleasure yacht not engaged in trade	378	Dredger
320	Gas carrier	380	MODU & FPSO
330	Chemical tanker	382	Special purpose ship
340	Bulk carrier	383	High speed passenger craft
353	Container	384	High speed cargo
355	Ro-Ro cargo	385	Tug
360	General cargo/multipurpose	399	Other special activities

Table 3 - Ship types as per PSC mapping to be used in Tag I

The following Table 4 and Table 5 indicate the character definitions in accordance with IEC61162-1.

ASCII	HEX	DEC	Description
<CR>	0D	13	Carriage return
<LF>	0A	10	Line feed – End of sentence delimiter
$	24	36	Start of sentence delimiter
*	2A	42	Checksum field delimiter
,	2C	44	Field delimiter
!	21	33	Start of encapsulation sentence delimiter
\	5C	92	Comment block delimiter
^	5E	94	Code delimiter for HEX representation of ISO 8859-1 (ASCII) characters
~	7E	126	Reserved for future use
<del>	7F	127	Reserved for future use

Table 4 – Reserved characters

ASCII	HEX	DEC	ASCII	HEX	DEC	ASCII	HEX	DEC
Space	20	32	@	40	64	`	60	96
Reserved	21	33	A	41	65	a	61	97
"	22	34	B	42	66	b	62	98
#	23	35	C	43	67	c	63	99
Reserved	24	36	D	44	68	d	64	100
%	25	37	E	45	69	e	65	101
&	26	38	F	46	70	f	66	102
'	27	39	G	47	71	g	67	103
(	28	40	H	48	72	h	68	104
)	29	41	I	49	73	i	69	105
Reserved	2A	42	J	4A	74	j	6A	106
+	2B	43	K	4B	75	k	6B	107
Reserved	2C	44	L	4C	76	l	6C	108
–	2D	45	M	4D	77	m	6D	109
.	2E	46	N	4E	78	n	6E	110
/	2F	47	O	4F	79	o	6F	111
0	30	48	P	50	80	p	70	112
1	31	49	Q	51	81	q	71	113
2	32	50	R	52	82	r	72	114
3	33	51	S	53	83	s	73	115
4	34	52	T	54	84	t	74	116
5	35	53	U	55	85	u	75	117
6	36	54	V	56	86	v	76	118
7	37	55	W	57	87	w	77	119
8	38	56	X	58	88	x	78	120
9	39	57	Y	59	89	y	79	121
:	3A	58	Z	5A	90	z	7A	122
;	3B	59	[	5B	91	{	7B	123
<	3C	60	Reserved	5C	92	|	7C	124
=	3D	61	]	5D	93	}	7D	125
>	3E	62	Reserved	5E	94	Reserved	7E	126
?	3F	63	_	5F	95	Reserved	7F	127

Table 5 – Valid characters

5. CB i XML Schema

The contents of the parameter code 'I' shall be a valid XML document as per the current XML schema. It shall be noted that the parameter code 'i' contents shall not contain the <i> root element.
The recipient may enclose the XML elements in the root element for validation purposes.

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<xsd:schema xmlns:ssn="urn:eu.emsa.ssn.vms"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
targetNamespace="urn:eu.emsa.ssn.vms" elementFormDefault="unqualified"
attributeFormDefault="unqualified">
      <xsd:annotation>
            <xsd:documentation xml:lang="en">SSN VMS Information
                  Comment Block XML Schema,
                  Copyright (c) 2011 EMSA
            </xsd:documentation>
      </xsd:annotation>
      <xsd:element name="IfieldType">
            <xsd:annotation>
                  <xsd:documentation>The root element of the
information comment block
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:complexType>
                  <xsd:all minOccurs="0">
                        <xsd:element name="S" type="ssn:TypeOfSensor"
minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Type of
Sensor.</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="Q" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Data Quality
      </xsd:documentation>
                              </xsd:annotation>
                              <xsd:simpleType>
                                    <xsd:restriction
base="xsd:integer">
                                          <xsd:pattern value="[1-5][0-
4]"/>
                                    </xsd:restriction>
                              </xsd:simpleType>
                        </xsd:element>
                        <xsd:element name="O" type="ssn:Participant"
minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Data
originator</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="R" type="ssn:Recipients"
minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Data
Recipient</xsd:documentation>
```

```
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="U" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Usage
policy</xsd:documentation>
                              </xsd:annotation>
                              <xsd:simpleType>
                                    <xsd:restriction
base="xsd:integer">
                                          <xsd:pattern value="[0-5][1-
2]"/>
                                    </xsd:restriction>
                              </xsd:simpleType>
                        </xsd:element>
                        <xsd:element name="E" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>SSN enrichment
information.</xsd:documentation>
                              </xsd:annotation>
                              <xsd:simpleType>
                                    <xsd:restriction base="xsd:string">
                                          <xsd:pattern value="[ABDHS
]{1,5}"/>
                                    </xsd:restriction>
                              </xsd:simpleType>
                        </xsd:element>
                        <xsd:element name="P" type="ssn:LocodeType"
minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Port Of Call:
use 5-digits LOCODE.</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="L" type="ssn:LocodeType"
minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Last Port: use
5-digits LOCODE.</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="T"
type="ssn:SatelliteInformationType" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Satellite
Information</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="I"
type="ssn:VesselIdentificationType" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Vessel
Identification</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                        <xsd:element name="M"
type="ssn:PositionValidationType" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Position
Validation  Method</xsd:documentation>
                              </xsd:annotation>
```

```
                        </xsd:element>
                        <xsd:element name="N"
type="ssn:PositionComputationType" minOccurs="0">
                              <xsd:annotation>
                                    <xsd:documentation>Position
Computation Method</xsd:documentation>
                              </xsd:annotation>
                        </xsd:element>
                  </xsd:all>
            </xsd:complexType>
      </xsd:element>
      <xsd:simpleType name="PositionValidationType">
            <xsd:annotation>
                  <xsd:documentation>
                        Provides information on the Position Validation
                        Method (Kalman or Correlation)
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="ssn:PositionValidationListType"/>
      </xsd:simpleType>
      <xsd:simpleType name="PositionComputationType">
            <xsd:annotation>
                  <xsd:documentation>
                        Provides information on the Position
Computation
                        Method (Predicted or Doppler)
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string">
                  <xsd:pattern value="[PD]:\d{5}_\d{5}_\d{3}"/>
            </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType name="SatelliteInformationType">
            <xsd:annotation>
                  <xsd:documentation>
                        Provides information on the Satellite, such as
                        groundStationAcquisitionTS,
dataCentreIngestionTS,
                        dataCentreDeliveryTS
                        satelliteId, groundstationId
                        Validation pattern:
                        (A:\d+($| ))?(I:\d+($| ))?(D[0-5]?:\d+($|
))?(L:"[\w
                        '\.-]+"($|
                        ))?(G:"[\w '\.-]+")?
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string"/>
      </xsd:simpleType>
      <xsd:simpleType name="VesselIdentificationType">
            <xsd:annotation>
                  <xsd:documentation>
                        Used to specify the ship identifiers currently
                        included in the SSN vessel registry

                        Validation pattern: (I:\d{7}($|
                        ))?(M:\d{9}($| ))?(C:\w{1,7}($| ))?(S:[VTN]($|
                        ))?(T:\d{3}($|
                        ))?(F:[A-Za-z]{2}($| ))?(R:[A-Za-z0-9]{1,12}($|
                        ))?(N:"[\w
                        '\.-]{1,35}")?
```

```
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string"/>
      </xsd:simpleType>
      <xsd:simpleType name="TypeOfSensor">
            <xsd:annotation>
                  <xsd:documentation>
                        Type of Sensor: is used to specify which kind
of
                        sensor/system provided the information.

                        Enumerated list to identify
                        system generating the
                        information (transponder on-board or
                        terrestrial
                        service - vessel detection systems, VTSs,
other).
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string">
                  <xsd:enumeration value="A">
                        <xsd:annotation>
                              <xsd:documentation>T-AIS: Terrestrial
AIS</xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="L">
                        <xsd:annotation>
                              <xsd:documentation>LRIT: LRIT mandatory
and pooled data
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="R">
                        <xsd:annotation>
                              <xsd:documentation>Radar: Coastal or
ship-borne radar-based vessel
                                    detection service
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="V">
                        <xsd:annotation>
                              <xsd:documentation>VTS: Coastal or port
VTS data
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="S">
                        <xsd:annotation>
                              <xsd:documentation>S-AIS: Satellite
AIS</xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="F">
                        <xsd:annotation>
                              <xsd:documentation>VMS: Fisheries control
- vessel monitoring
                                    service
                              </xsd:documentation>
                        </xsd:annotation>
```

```
                  </xsd:enumeration>
                  <xsd:enumeration value="O">
                        <xsd:annotation>
                              <xsd:documentation>VDS: Satellite-based
vessel detection service
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="M">
                        <xsd:annotation>
                              <xsd:documentation>MRS: Mandatory
reporting systems
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="T">
                        <xsd:annotation>
                              <xsd:documentation>TEST: Test
purposes</xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="G">
                        <xsd:annotation>
                              <xsd:documentation>SSN
generated</xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="Z">
                        <xsd:annotation>
                              <xsd:documentation>SSN generated
+fusion</xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="W">
                        <xsd:annotation>
                              <xsd:documentation>T-
AIS+RADAR</xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="X">
                        <xsd:annotation>
                              <xsd:documentation>'Military'/Defence
system: e.g. partner data
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="I">
                        <xsd:annotation>
                              <xsd:documentation>T-AIS+VDS: Terrestrial
AIS position correlated
                                    with satellite-detected target
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="Y">
                        <xsd:annotation>
                              <xsd:documentation>S-AIS+EO VDS:
Satellite AIS position correlated
                                    with satellite-detected target
                              </xsd:documentation>
                        </xsd:annotation>
```

```
                  </xsd:enumeration>
                  <xsd:enumeration value="J">
                        <xsd:annotation>
                              <xsd:documentation>S-AIS+RADAR: Satellite
AIS position correlated
                                    with coastal or ship-borne radar-
detected target
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="B">
                        <xsd:annotation>
                              <xsd:documentation>LRIT+VDS: LRIT
positions correlated with
                                    satellite-detected target
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="C">
                        <xsd:annotation>
                              <xsd:documentation>LRIT+RADAR: LRIT
positions correlated with
                                    coastal or ship-borne radar-
detected target
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="E">
                        <xsd:annotation>
                              <xsd:documentation>VMS+VDS:" VMS
positions correlated with
                                    satellite-detected target
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
                  <xsd:enumeration value="H">
                        <xsd:annotation>
                              <xsd:documentation>VMS+RADAR: VMS
positions correlated with coastal
                                    or ship-borne radar-detected target
                              </xsd:documentation>
                        </xsd:annotation>
                  </xsd:enumeration>
            </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType name="LocodeType">
            <xsd:annotation>
                  <xsd:documentation>
                        use 5-digits LOCODE.
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string">
                  <xsd:pattern value="[A-Z]{5}"/>
            </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType name="Participant">
            <xsd:annotation>
                  <xsd:documentation>
                        Participant ID:
                        for Country Code use ISO 3166-1
                        alpha 3 (trigraph code) or
```

```
                        alpha 2 (bigraph code);
                        for Port ID use
                        5-digits LOCODE; 2-9 for the 3 last digits) 0-9
is
                        covered to satisfy
                        SSN_Specific where 0, 1 allowed;
                        for MMSI use ITU-R M.585;
                        for MID use
                        Maritime Identification Digits defined by ITU,
                        for LRIT ID use the
                        LRIT ID type,
                        for IPv4 address use the HEX notation as
described in
                        the documentation
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string">
                  <xsd:pattern value="([A-Z0-9]{1,3}|[0-9]{3}[A-Za-
z]{3}|[A-Za-z]{2}|[X][A-Z]{2})(\.([A-Za-z]{3}|[A-Za-z]{2}|[0-9]{4}|[A-
Za-z0-9]{5}|[0-9]{9}|[A-Za-z0-9]{8}|[A-Z]{2,10})){0,3}"/>
            </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType name="Recipients">
            <xsd:annotation>
                  <xsd:documentation>
                        List Of Recipients

                        The maximum allowed number of
                        recipients is 10.

                        The maximum number of Sub ID supported shall be
3.
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:list itemType="ssn:Participant"/>
      </xsd:simpleType>
      <xsd:simpleType name="PositionValidationItemType">
            <xsd:annotation>
                  <xsd:documentation>
                        Provides information on the Position Validation
                        Method (Kalman or Correlation)
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:restriction base="xsd:string">
                  <xsd:pattern value="[KCD]:\d{5}(;\d{5})*"/>
            </xsd:restriction>
      </xsd:simpleType>
      <xsd:simpleType name="PositionValidationListType">
            <xsd:annotation>
                  <xsd:documentation>List Of PositionValidationItemType
                  </xsd:documentation>
            </xsd:annotation>
            <xsd:list itemType="ssn:PositionValidationItemType"/>
      </xsd:simpleType>
</xsd:schema>
```

6. Examples

6.1. SATELLITE AIS MESSAGE

The following XML document corresponds to a satellite AIS message.
It shall be noted that the the message should not contain the <i> root element which is included for validation by the recipient.

```
<i>
        <s>S</s>
        <Q>12</Q>
        <O>XDP</O>
        <R>ITA</R>
        <U>1</U>
        <E>A B D H S</E>
        <P>PTLIS</P>
        <L>FRMRS</L>
        <I>I:9320544 M:247158500 C:IBHD F:IT T:323 N:"COSTA CONCORDIA"</i>
        <M>K:9999 C:99999 D:88888</M>
        <N>P:99999</N>
        <T>A:123456789 I:123456789 D:123456789 L:AIS-SAT1 G:"Svalbard-5"</T>
</i>
```