Paper for consideration by NIPWG

Current work status of S-125 Navigational Services

Submitted by:	S-125 team within NIPWG
Executive summary:	Report of the progress on the S-125
Related documents:	Annex 1 - Data model draft
Related projects:	S-125

1   Introduction / Background

At NIPWG2 it was decided there would be a task team assigned to working on the s-125 – Navigational Services. The work would include additional light data (work originating at SNPWG), as well as other AtoN such as AIS/V-AIS AtoN and GMDSS data. Within the team there was hope that the S-125 could also "absorb" much of the Notices to Mariners.

A data model would be created that would attempt to encapsulate all the objects it was expected to contain.

This paper describes the work completed to date based on the last two NIPWG meetings and an overview of the major discussions that have come up within the task team for the NIPWG group to consider.

1.1   Initial test dataset and data model

As an action item of NIPWG1, the initial test dataset was created and reviewed at NIPWG2. The test data content was based on previous discussions within SNPWG and was written to include textual presentation alongside the features presented. The following were initial features added to the data model.

- Support / Structure / AtoN:s
  - Seasonal AtoN (buoys withdrawn or replaced in winter or ice-conditions)
- Equipment
  - Lights
    - Strip light
    - Lite Pipe
  - Sound signals
  - Racon
  - Manually activated AtoN- equipment
- AIS AtoN
  - AIS AtoN (As sent by message 21)
  - AIS ASM (Other application specific messages sent by AtoN)
  - V-AIS Base stations sending virtual and synthetic AIS (affects range)
  - AIS relaying stations, and AIS- network description (affects range)

- DGNSS- stations
  - Merely a copy of data in S-240
- The need for unique identifiers was identified, and these were included in the test dataset, but the current IALA MRN- scheme was not used at the time.

The test data set has not been updated since NIPWG2, when the work took a slightly new approach. Some features are reported and known to be still missing in the initial draft and data model:

- Radio beacons
- Descriptions of visual appearance as described in List of Lights

The need for unique identifiers was identified, and these were included in the test dataset, but the current IALA MRN- scheme was not used at the time.

As a conclusion of the discussions at NIPWG2, a slightly new approach to development of S-125 was taken. It was decided to investigate whether time-sensitive information, chart- updating capability and related parts of Notices to Mariners could be absorbed as a part of the Navigational Services.

2   Analysis / Discussion

2.1   Scope and UseCases
The scope of the AIS- AtoN is defined as message 21 only. No other Application Specific Messages (ASM) from AIS is considered, even if it was sent from the same AtoN.

The following uses for S-125 were identified:

- Use as an electronic list of lights
  - containing the data currently in existing list of light
  - extending the AtoN data on ENC
- Use as a streaming / update service of AtoN- data
  - containing data also in ENC
  - data assumed to be updated more frequently than S-101, or even streamed in the future

2.2   Update frequency
The assumed update frequency of the new product is identified to play a major role in regards of added value, interoperability and modeling of time-sensitive data as temporary and seasonal changes.

1) Static product, update frequency equal to S-101
   a) This option assumes the S-125 is created and updated together with the ENC
2) Static product, but updated more frequently than S-101
   a) This option assumes that either the internal process for making changes into ENC (S-101) includes more delay than updating the S-125, or due to bandwidth the S-125 is easier to retrieve onboard using narrow bandwidth.
3) Dynamic product, data is streamed and updated in near real time

a) This option assumes there is a future streaming- service available, and changes in AtoN- data will be available in near real time to those vessels available to receive the data.

The assumed update frequency of S-125 will affect the data modeling, and must therefore be estimated. For example, if we assume frequent updates, we could always display the current state of temporary or seasonal buoys. If we assume low update frequency, we will be able to display only the schedule of a seasonal buoy and the nature of a temporary AtoN.

2.3 Duplication of data

Most data in the S-125 will also be present in the S-101. Should this data be duplicated in the S-125 in order to create a standalone product? Current discussions suggest that S-125 should include the entire relevant feature data needed, even though that data is then duplicated into several different Product Specifications (S-101, S-201 & S-125).

- Benefit:
  This approach would enable future use of separate AtoN-data delivery (webservice, streaming), offline use, or printing a List of Lights out of S-125.
- Drawback:
  This approach would also bring duplicated data to the ECDIS -user.

2.4 Delta encoding of the data

Delta encoding is a way of storing or transmitting data in the form of differences (deltas) between data rather than complete datasets. A delta set of S-125 could contain only additional and/or updated data. The possibility to use delta encoding within S-100 should be further investigated, at it would enable smaller subsets of the full dataset to be transferred.

2.5 Interoperability

The content of S-125 is Navigational aids. Most of these will also be present in S-101. S-125 might include;

- Additional data to features in S-101
- Additional features, that are not included in S-101 (f.ex. temporary aids)
- More recent data than that included in S-101

The two last entries might be feasible only if S-125 has a higher update frequency than S-101. The use of IALA MRN- scheme is an important part of interoperability, but is discussed in a different paper.

The current interoperability analysis, as presented at S-100TSM4-3.7 specifies an Interoperability Catalogue (IC) and identifies 5 levels of interoperability between product specifications. These are;

- Level 0

- o No explicit interoperability and IC is not used; ENC is the main product; all other data is loaded as overlays effectively current ECDIS
- Level 1 - Data interleaving;
  - o ENC is the main product but feature layers from other products are interleaved with ENC feature layers
- Level 2 - Type based selective feature class replacement;
  - o ENC is the main product but global suppression of equivalent ENC features is allowed in favor of data layers from superior data products
- Level 3 - Attribute value based selectivity and feature hybridization;
  - o ENC is treated as one of the components of the data stack, and selected feature instances from other products may be treated as being superior to or enhancing selected ENC feature instances
- Level 4 - Spatial operations;
  - o This level is the same as Level 3, but permits spatial queries (to determine related subsets) and operations (to define the interoperation result) to determine replacements for selected feature instances; rules are explicitly defined using an adequate set of spatially capable 'grammar'

Regarding S-125 levels 2 and 3 are the currently assumed interesting ones. Level 4 is assumed to be irrelevant for S-125, as we plan to include the MRN for uniquely identifying the objects.

- Level 2 interoperability in S-125
  - o Features in S-101could be replaced by features in S-125. This assumes all feature data is available in S-125, not only the additional data. Practically AtoN data in S-101 is replaced by equivalent data if present in S-125.
- Level 3 interoperability in S-125
  - o Features in S-101 could be extended by data form S-125. Not all data would need to be substituted or even available in S-125 available. S-125 would maybe not need to be "superior" to S-101, if data was only "enhanced" and certain important data was never replaced. Regardless, an indication of updated data could be displayed as part of the AtoN.

3   Actions required by NIPWG
NIPWG is asked to;

- Note the paper
- Discuss the content, and give directions for further progress