Paper for Consideration by NIPWG

Nautical Publications Product Specifications Compared

Submitted by:	Raphael Malyankar
Executive Summary:	This paper compares the NIPWG product specifications which have been developed to date and points out potential issues expected to arise in the course of developing and managing a series of related product specifications.
Related Documents:	--
Related Projects:	S-100

Introduction / Background

Given that three NIPWG product specifications are approaching release as Edition 1.0 (S-122 – Marine Protected Areas; S-123 – Radio Services; S-127 – Marine Traffic Management), a fourth is under active development (S-128 – Catalogue of Nautical Publications), and a fifth (S-126 – Natural Conditions) has been explored, it is appropriate to consider

- common characteristics,
- issues,
- approaches in NIPWG product specifications,
- product specifications for nautical publications, and

consider what issues are likely to arise

- in developing,
- managing,
- and using a set of related product specifications that do not arise for unrelated specifications.

This paper provides an initial list and analysis of these issues. The focus of this paper is primarily S-122, S-123, and S-127, since these are currently the most mature product specifications in the nautical publications (NPUB) domain.

References

Nautical publications product specifications (S122, S-123, S-127, S-128), URL: <https://www.iho.int/mtg_docs/com_wg/NIPWG/NIPWG_Misc/NIPWG_ProdSpecs.htm>.

[TSM5-4.11] Updating GML datasets. URL: <https://www.iho.int/mtg_docs/com_wg/S-100WG/TSG5/TSG5_docs.htm>.

General characteristics

The **general purpose** of S-123 (Radio Services), S-122 (Marine Protected Areas), and S-127 (Marine Traffic Management) is the same – information overlays for ENC on onboard devices supporting safe navigation. Their **specific usage** scenarios are also mostly the same – route planning. Some of the other specifications will have different purposes and use scenarios (e.g., S-128 – Catalogue of Nautical Publications).

The **transfer mode** has so far been the transfer set – datasets consisting of multiple data objects, packaged in an exchange set. Transactional and message-based modes were not planned in Editions 1.0. Future marine safety information (MSI) data or even real-time update mechanisms for nautical publications or ENCs (chart corrections from Notices to Mariners) may require other modes, specifically, message-based or online transfer. (Online exchange is introduced in S-100 for the first time in Edition 4.0.0, Part 14.) The commonalities for message-based or online exchange modes in S-100 will probably be the interchange protocols and wrappers, and type of content (instances of features and information types).

The **update mechanism** defined in S-122/123/127 Editions 1.0 is “whole-object” replacement. Variations will depend on transfer modes and specific use scenarios – see the analysis in TSM5-4.11 for GML data and the description in S-100 Part 10a for ISO 8211 data.

Spatial representation: S-122, S-123, and S-127 are all vector data. Most other NIPWG specifications are also likely to be vector data, but use cases for coverage-based information may arise in other NIPWG specifications.

Portrayal is not yet defined in the NIPWG product specifications, because its status in S-100 stabilized only recently (Edition 4.0.0) and because NIPWG did not feel confident in devising symbology for use in ECDIS or other onboard devices. For complete and usable product specifications, and for interoperation with other product specifications, portrayal in NPUB specifications needs to be addressed soon (Editions 1.X or 2.0).

Data models and feature catalogues

The **feature classes** in the developed and planned NPUB specifications differ and will clearly continue to differ, since the application domains are different. The **information classes** have nearly all been stable, undergoing only small changes over 2017-2018 during the development of the three product specifications of which two have reached Edition 1.0 and one has reached the release candidate stage. Of the 10 information classes defined by NIPWG, only *ShipReport* is not used in all three product specifications (it is not used in S-123). Of the geographic feature classes, the *RestrictedArea* class from S-101 (or its successors *RestrictedAreaNavigational* and *RestrictedAreaRegulatory*) are used in two out of three product specifications (S-122 and S-127), as are *VesselTrafficServiceArea* or its spin-offs *ShipReportingServiceArea* and *LocalPortServiceArea*. Given that ship reporting requirements in one form or another are widespread and likely to increase, it is likely that *ShipReportingServiceArea* in particular will be used in multiple NIPWG specifications. (The same applies to the restricted area features, but those originated in ENCs and the S-101 PT will probably want primary control of their evolution.)

One common issue which NIPWG has not yet discussed is how to encode information which applies to the entire cell. In the S-127 sample dataset this issue is dealt with *ad hoc*, by association of an appropriate information type to the *DataCoverage* feature for the dataset. A standard approach should be developed, taking portrayal and alerts/indications into account.

Associations and roles are largely consistent, except for domain-specific feature associations and some minor evolution of names and definitions due to feedback and generalization of names and definitions for reuse.

Meta-features (*DataCoverage* and *QualityOfNonBathymetricData*) and the single cartographic feature (*TextPlacement*) are the same, allowing for minor revisions of their modeling from 2017 to 2018 by the Data Quality Working Group and S-101 PT.

Indeterminate (fuzzy) areas are currently used only in S-127. Indeterminate areas are potentially useful in some but not all of the likely future NIPWG product specifications.

The **abstract hierarchy of geographic feature classes** based on information associations (the *FeatureType* – *OrganisationContactArea* – *SupervisedArea* – *ReportableServiceArea* hierarchy in S-127) should be retro-fitted into S-122 and S-123 in Editions 2.0, and considered for use in new related specifications.

The above similarities and differences in the application schemas are reflected in the XML feature catalogues, data formats (GML XSD files), and validation tests.

Data sources, data mapping and sample datasets

Data sources vary. While the main sources are and can be expected to continue to be “nautical publications” (in a broad sense, not just those published by national hydrographic offices), other compiled data or data sources may sometimes be a better source of certain aspects of information, e.g., GIS compilations of protected areas, or even the ENCs (for routeing measures). ENCs can be expected to be an important source for spatial information, either as-is (re-use the geometry of an existing ENC feature) or as one component (e.g., reference locations and shorelines).

Data preparation: In principle, data can also be created with updated chart editor ENC or GIS tools. This would be the preferable approach in the absence of programmatically convertible externally sourced data. For information that is only described verbally in a publication, neither legacy data, externally sourced data, nor editor tools are currently available, which means the sample datasets need to be largely handcrafted from the NP1 text samples (geometry can often, though not always, still be reused from ENC features or other sources, or calculated with off-the-shelf GIS tools).

The ENC test dataset (“Jussland”) has been used as a base for S-123/127 sample data. This test dataset was designed for ECDIS testing and is not necessarily suited for NPUB testbeds (one reason being that it covers a relatively small surface area near land, which means that it gets cluttered and larger offshore features look

unrealistic, e.g., a feature might be placed far outside the original bounds of the Jussland ENC test dataset). S-122 data samples used real protected area data from the U.S., Brazil, and Republic of Korea. For future specifications and samples, an expansion of the Jussland dataset, or use of selected real ENCs for base datasets, should be considered.

The **mapping** of NP1 (or NP2) test data to the object model used by NP3 S-100-based datasets is at present partly subjective. The sample datasets accompanying Editions 1.0 show it can be done, but there is still some latitude in how much detail to have in the end result (e.g., how much detail to encode in a **Regulation** information type). One recurrent labor-intensive task is encoding text statements describing the applicability of various statements (often, but not necessarily, regulations) to different subsets of vessels. Guidelines for such tasks need to be crystallized and added to the DCEGs in Editions 2.0.

Product specification content

The **general material** in the S-122/123/127 DCEGs (clauses 1–3) is mostly the same (with the obvious exceptions, i.e., specification number, etc. and domain-specific feature classes in examples and lists). (Keeping it the same in S-122/123/127 was an unstated requirement.) While some of the general material is merely introductory, some consists of encoding rules intended for cartographers, editors, and developers. The encoding rules in particular can be expected to evolve over the short term as experience is gained with data preparation for test-beds and other product specifications. In the long term, the general rules for these product specifications should stabilize and converge. The immediate issue is that in the near future, successive versions of the general encoding instructions may be slightly different. In theory there is no problem with this, but in practice there is the potential for both encoder/developer confusion and informal crossovers where the general rules from one specification are used in preparing datasets for a different product specification. Further, even in the long term, it would shorten the learning period for encoders and developers to have a guarantee that either the common encoding rules are the same, or at least that the differences across product specifications are clearly distinguished.

The similarities and differences in the **specific parts** of the product specifications (in the DCEGs, the content of feature tables, associations, and roles) reflect the similarities and differences mentioned in the discussion of data models earlier in this paper. Further, S-127 Edition 1.0 uses a pictorial depiction of attributes and associations in feature tables, replacing the rows and sub-tables in the S-122 and S-123 DCEGs. The final form of these feature tables remains an open question.

Conclusions

A high proportion of the S-100-based product specifications in NIPWG domains can be expected to have much in common. The following questions arise:

1) How important is it to keep common material in the NIPWG family of product specifications harmonized?
2) At what point should any harmonization attempt be made – Editions 2.0, earlier, or later?
3) What should be the method to achieve harmonization?
    a. Informal or formal re-use of content – project teams are either informally encouraged or required to copy common material and portions of application schemas from earlier product specifications.
    b. Common content base – e.g., prepare a base of common content, manage it outside of any particular product specification, and require it to be reused by project teams.
    c. Another method?
4) What restructuring of product specification components is needed, if any?
5) How would any restructuring or re-use interact with versioning of product specifications? (Perhaps managing the interaction is just a matter of treating clarifications (to common material) differently from revisions and new editions, given that clarifications do not cause substantive semantic changes, and revisions or new editions may cause substantive changes or require changes in datasets.) Should general rules be treated differently from object types?
6) What are the criteria for deciding which product specifications should share material with other product specifications? (E.g., overlapping application schemas, the same purposes and uses, etc.)

While it is as yet too early to attempt more than informal harmonization product specifications, future product specification development and revision efforts should be encouraged to keep the harmonization issue in mind,

and NIPWG should revisit the questions of ensuring and managing harmonization as product specifications mature.

Action Requested of NIPWG

The NIPWG is invited to:

a. Note this paper.

b. Act as appropriate.