

## Paper for Consideration by NIPWG9

### Testing S-127 capture.

<b>Submitted by:</b>	IIC Technologies,
<b>Executive Summary:</b>	A summary of efforts in digitising S-127 data for CCG
<b>Related Documents:</b>	S-127 Product Specification
<b>Related Projects:</b>	S-123 Digitisation project and revision

### Introduction / Background

IIC Technologies completed an initial digitisation of S-127 data under contract to the Canadian Coastguard (CCG) using a selection of data from the CCG publication Radio Aids to Marine Navigation (RAMN) as a source. This paper describes a summary of this activity, and makes some observations and recommendations following the conclusion of the project.

### Analysis/Discussion

#### S-100 Part 10b observations.

Many of the difficulties in creating data for S-127 are related to the challenges posed by the GML profile under S-100 edition 4.0.0 Part 10b. These mostly stem from:

1. Discrepancies or differences between the Application Schema data structure as expressed by the GML Schema and the same structure as expressed by the feature catalogue. From an S-100 framework perspective both elements of the product specification express the “structure” of the data. There are a number of differences in the way the structure is expressed however, namely:
  - a. The use of multiple intermediate types in the construction of the GML elements
  - b. Different options in Part 10b for the creation of the schema
2. As an implementer of tools to create GML data in conformance with Part 10b this poses a number of challenges, and ultimately results in the requirement for the creation of product specific “drivers” for each product specification which are capable of full conformance with the published GML Schema.
3. During the period of the project, S-100 edition 5.0.0 was in production and many of the observations made were fed into the revision of Part 10b now proposed by the S-100WG at HSSC14. The revision to Part 10b takes a different approach to the creation of the schema for products using GML and dramatically tightens the mapping between the feature catalogue content and the GML schema.
4. These changes should mean that, for data production tool providers, it is possible to create fully conformant GML using the feature catalogue as the primary reference, rather than requiring a GML Schema for its creation – the GML Schema remains an important element for validation of data but the element of “authorship” it introduced under edition 4.0.0 should be eliminated.

#### S-127 Model and Application Schema

Against that backdrop many of the practical challenges of creating S-127 data have now been addressed. The following observations are made in respect of the S-127 model itself. These are more fully described in the accompanying presentation and it is hoped can be reviewed for possible inclusion in an S-100 edition 5.0.0 revision to S-127.

**VTS Sector vs VTS Area.** There is currently no distinction made between a “VTS Sector” and the zone or greater “area” of which it is a part. There is a single feature Vessel Traffic Service Area but no concrete guidance on how to represent the individual areas. The RAMN expresses structures common to many VTS globally as a set of non-intersecting “sectors”, all of which constitute a single “zone” (area) subject to vessel traffic control. This area of the Application Schema could be revised to more closely match the reality of VTS implementation and make the differences explicit for end users. ENC (S-101) does not make the distinction either but does draw attention to the difference in the DCEG.

† For each instance of **information**, at least one of the sub-attributes **file reference** or **text** must be populated.

INT 1 Reference:

### 22.2.1 Vessel traffic service area

If it is required to encode an area within which a competent authority provides services to vessels as part of a Vessel Traffic Service (VTS), it must be done using the feature **Vessel Traffic Service Area**. The area should be captured based on the limits of the VTS or VTS sector.

Remarks:

- Separate **Vessel Traffic Service Area** features should be captured for individual VTS sectors where appropriate.

Distinction: Administration Area; Custom Zone.]

Figure 1: VTS Area remarks re: Sectors (S-101 DCEG)

S-127, however, is a more detailed description of VTS layouts and the lack of a discriminating, hierarchical layout for them could be seen as a shortcoming of the model. At the very least, for the end user the lack of a distinction between a VTS Sector and the overall area to which it relates is confusing. The term “VTS Zone” is also in common usage and S-127 makes no provision for its representation.

**Description of textual positions.** In a number of areas in the publication, positions are referred to by DMS or other textual formats. This is (sometimes) reflective of the publication’s status as the implementation of one or more legislative acts with positions replicated from those acts – fulfilling a state’s duty of publication. In order to retain the ability to promulgate coordinates in their original form a “locationByText” attribute or mechanism would be useful as an optional InformationType or inline attribute in the primary geospatial features. The positional information of the feature would be unchanged but this would allow encoding of the legally defined position. This also assists organisations who wish to maintain their original publication contents.

**Encoding logical rule structures.** Encoding of defined, arbitrary rule structures in S-127 follows the model specified in the application schema, with a combination of relationships and information types, joined with logical conjunctions and applied to a set of vessel types (and dimensions). The model is rich and allows a large variety of rules to be encoded, and then subsequently retrieved/parsed by the implementing system. This is a large part of the “vectorisation” goal of products such as S-127 and the RAMN digitisation enabled a thorough test of the model facilities. Some examples are included in the accompanying presentation and show some of the challenges in creating vectorised equivalents of such rules. This area of the model could use a more thorough review to establish, generally:

- a. How to make the model apply to more general rule structures
- b. How users will navigate and comprehend such encoded rule structures
- c. Whether goals of automation are practical and how they would work in practice, particularly where a mixture of vectorised and textual rules are present.

**Hierarchies for Contact Details.** The lack of a hierarchy for contact details means that it is hard to reproduce certain tables in the RAMN . These are grouped either by some kind of “function”, e.g. “MCTS Centre” or region “ECAREG”. If the purpose of S-127 data is to also support the creation of textual publications then such hierarchies are the only way enable such parallel production.

**Coverage.** There are numerous features relating to the entire “coverage” of the publication. However, these restrictions or recommendations can not be associated with the DataCoverage feature. Some consideration should be given (and documented in the DCEG) as to how such features should be implemented simply, or whether restrictions and regulatory features should be enabled for DataCoverage features..

**Relationships and the DCEG.** The creation of the S-127 data requires a large number of relationships between geospatial features and the semantic content included in the information types. Aside from the challenges of user interfaces for ongoing management, this network of relationships and the encoding “norms” expressing them should be more explicitly documented in the DCEG. The current DCEG is heavily weighted in favour of UML diagrams and explanations of data structure, rather than encoding by example and it would be useful to supplement the content with more explicit examples which show how the Application Schema works, rather than describing it an abstract level. The RAMN content offers numerous examples for such inclusion in the DCEG content.

Note: FOR REASONS OF ECONOMY, DELEGATES ARE KINDLY REQUESTED TO BRING THEIR OWN COPIES OF THE DOCUMENTS TO THE MEETING

**Feature Catalogue and GML Schema:** There are some minor observations and discrepancies between feature catalogue and GML Schema, for example:

1. An extra space in the name for "logical disjunction "
2. "sms" vs "SMS" enumeration labels
3. The vessel types in enumerations could use some additional values
4. Upbound/downbound are not valid enumeration values for traffic directions in radio calling in points
5. A mismatch in the multiplicity of textContent between the feature catalogue and GML Schema

These are noted in more detail, with examples in the accompanying presentation.

### **Recommendations**

1. Revise S-127 to S-100 edition 5.0.0. This enables a much simpler, framework level implementation of GML creation, conformant to the published edition of the standard
2. Review and enhance the modelling of S-127 in respect of the comments and observations made in this presentation and paper

### **Justification and Impacts**

1. S-127 will play a key role in future S-100 ECDIS and will require an S-100 edition 5.0.0 publication.
2. S-127 has been established for some time and retains many common elements with other product specifications too. It is imperative these encoding "norms" are tested and developed before they are rolled out to end users through upcoming S-100 ECDIS implementations.

### **Action Required of S101 PT**

The NIPWG is asked to:

1. Consider a revision of S-127 to bring it up to S-100 edition 5.0.0
2. Consider the observations made on the S-127 model, feature catalogue and GML Schema and revise these items accordingly, potentially using a small drafting group, for submission to the next NIPWG meeting.