Paper for Consideration by S-100WG TSM

Revision of GML Annex

Submitted by:	IIC Technologies, Teledyne Caris, Canadian Coast Guard
Executive Summary:	Revision of S-100 Part 10b GML Annex.
Related Documents:	S-100 Edition 4.0.0 Part 10b.
Related Projects:	OGC MLB Pilot project

Introduction / Background

The GML profile dates back many years to 2005, and has been used as the source for a number of key product specifications including those destined for S-100 ECDIS through many revisions of S-100. Recent experiences with the profile, and the conclusion of the OGC Maritime Limits and Boundaries project has resulted in some observations on the current S-100 edition 4.0.0 GML profile.

Although GML is now an old standard and built on XML, it is still widely supported in the geospatial community and its profile under S-100 has an extensive user base. It is a possibility that in the future other encodings, most notably GeoJSON, may provide similar features (and it is noted that the OGC standards baseline is moving towards far more encoding-neutral frameworks for their standards) until that time (and certainly in the timeframe of S-100 Edition 5.0.0) the existing profile can be usefully modified to optimise its use.

This paper is provided for information. A forthcoming proposal from the authors will present a redline copy of the Annex for consideration by S-100WG

Analysis/Discussion

The current Part 10b of S-100 provides a sound, workable implementation of GML but has some shortcomings, specifically:

1. The approach in Part 10b is to manually define a GML Application Schema using the collection of definitions in the part. This requires an additional, predominantly manual step in the creation of a product specification, following the model and feature catalogue creation. Much of the content in a GML Application Schema is replicated (albeit in XML Schema form) from the feature catalogue.
2. Some of the content is now outdated and IHO-specific, for example DSID information, FOID identifiers and coordinate multiplication factors.
3. Options are introduced which hinder automatic parsing of GML files and extraction of feature and information types. There is ambiguity within GML Application Schemas created under the profile due to these options. Examples are naming of associations/roles and adoption of labels/values for listed values in schemas.

This paper introduces a number of proposed revisions to the GML profile. The GML revision proposed by this paper is targeted at S-100 edition 5.0.0 and has the following overall aims:

1. A modernisation of the content to bring it up to date with other parts of S-100 and to take out outdated elements currently included. This will also be focused on increasing interoperability of “S-100 GML” with mainstream GI tools and technologies.
2. Reduction of the amount of “leeway” offered within the profile in the construction of GML Application Schemas. This would make the profile more tightly defined and make the mapping from a product specification feature catalogue to its GML application schema bijective.
3. The extension of the GML profile to better cover the construction of datasets from individual feature and information types.

The overall structure of the S-100 GML profile should remain the same, all changed proposed are incremental in nature and aimed at producing a tighter profile which will enable comprehensive implementation by industry stakeholders. More specifically, the modifications proposed to the GML profile are:

1. A defined mapping from the S-100 primitive types to GML types
2. Standardisation of GML schema element naming. This would make explicit the mapping of the names/codes defined in the feature catalogue to the GML elements for
    a. Features and Information types
    b. Attributes and sub-attributes including multiplicities and listed values
    c. Associations and roles
3. Standardisation of GML dataset layout and feature collection methodology. This would make the division between the dataset feature elements and the aggregation of those elements clear, giving the dataset metadata a specific definition. This will greatly benefit interoperability with existing open source (and commercial) frameworks and also enable realtime and data streaming use cases by providing a clear separation between the dataset header and collection items.
4. Removal of outdated items:
    a. DSID metadata where not required
    b. DSPM items including feature/geometry counts and coordinate/sounding multiplication factors.
    c. FOID, in place of MRN (as a feature attribute) and gml:id as the unique identifier within GML datasets.
5. A tighter selection of GML geometry primitives which are able to be used and the mapping of those primitives to the geometry levels specified in S-100 Part 7
6. An unambiguous specification - where options are still allowed, a default will be specified and a configuration parameter in metadata will denote the choice selected (e.g. value codes/labels in listed value encodings)
7. Efforts to ensure datasets are interoperable with broader GIS technologies:
    a. Use of standard GML types where possible, instead of S-100 extensions (removal of generic associations will improve this)
    b. Removal of very S-100 aspects like coordination multiplication factors
    c. Standardisation of feature collection forms and syntax
    d. Settling on v3.2.1 which has widespread adoption among implementers
8. The requirement of “precedence” to ensure entities are named before use is not required by GML itself and should not be a constraint on the GML profile.
9. The insertion of more complete, normative example features and datasets for use by implementers. This will be accompanied by the installation of the revised GML profile within the IHO website for online implementation and validation.

Conclusions

The existing Part 10b, whilst providing a good GML implementation for S-100 provides much leeway and does not provide a sound basis for automated ingest of GML data. The modifications suggested would take out ambiguities and provide a concrete mapping between the feature catalogue content and the GML schema for product specifications under S-100. The modernisation and update of the GML profile will increase interoperability with existing GML tools and complement the open source nature of these tools.

Recommendations

A revision of Part 10b with the aims as stated in this paper included in S-100 edition 5.0.0

Justification and Impacts

Revision of the GML Part 10b would require new product specifications to be conformant with the part (the changes are unlikely to be backwards compatible). This would also require older product specifications to be revised to produce GML Application Schemas conformant with Part 10b. The impact of tightening the mapping between the feature catalogue and the GML Schema would reduce the work necessary to create the Application Schemas however, reducing substantially the work necessary to bring older product specifications up to S-100 edition 5.0.0 level.

Action Required of S100TSM

The S-100WG TSM is asked to

1. Consider the aims and content of the proposal for the S-100 Part 10b
2. Support the creation of a revision to Part 10b of S-100 in the forthcoming edition 5.0.0
3. Contribute any additional items that may be necessary with the aim of optimising implementations by the stakeholder community.