Paper for consideration by TSMAD

S-100 GML profile analysis

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Executive Summary:	Analysis of the draft GML profile for S-100.
Related Documents:	(1) S-100 Ed. 1.0.0 (2) TSMAD26/DIPWG5-11.3A S-100 GML profile progress; (2) TSMAD25-4.3.12A/B Development of a GML profile for S-100
Related Projects:	(1) S-100

1   Introduction

This paper describes the results of a review of the S-100 GML profile intended to identify items needed to make it ready for use as a basis for S-100 data sets. Related issues which are relevant but not within the strict scope of a GML profile as defined in ISO 19136 are also addressed. The profile version used is the one distributed in February 2013, after TSMAD 25. This review is based on converting a sample nautical publications XML dataset for marine protected area information to use the GML profile.

2   Terms and Abbreviations

INSPIRE   Infrastructure for Spatial Information in Europe (EU project)

3   References

IN.D.2.5: D2.5: Generic Conceptual Model, Version 3.4rc3. INSPIRE draft document D2.5_v3.4rc3, 05 April 2013.
IN.D2.7: D2.7: Guidelines for the encoding of spatial data, Version 3.3rc3. INSPIRE draft document D2.7_v3.3rc3, 11 June 2013.
ISO 19136: Geographic Information – Geography Markup Language
OGC 10-129r1: Geographic Information – Geography Markup Language (GML) – Extended schemas and encoding rules

4   Discussion/Analysis

ISO 19136 defines a profile of GML as a specific subset of GML. Documents valid under the profile are supposed to be valid under the full GML schema. An application schema may extend and use types from the profile, but must do so in its own namespace.

A GML profile meeting the ISO definition still leaves room for variations between different S-100 application schemas (e.g., encoding of complex attributes), which has positive aspects (flexibility for different applications, exchange modes, and domains) as well as negative aspects (complexification and non-reuse of application XML schemas, code bases and software libraries). This issue should be discussed as part of the GML discussion at TSMAD 27. Decisions can be described by (a) Prototype S-100 XML schemas extending the profile as necessary (e.g., by defining generic feature and information types), and (b) rules or guidance in a new Annex 10b to S-100 Part 10.

The optimal approach may be to retain the S-100 GML profile as conforming to the ISO 19136 rules as much as possible, then resolve ambiguities and fill in gaps for S-100 constructs common to all S-100 application schemas. The latter should be possible through the additional XML schema files that extend the GML profile. From the GML perspective, these are application schema prototypes or stubs.

Results are listed in the table below. The "Resolution Component" column indicates where the issue might be addressed.

ID	Category	Resolution Component	Gap / Current Situation / Action
1	Data format	GML profile	The profile does not use topology indicators for point associations or the types GM_OrientableCurve & GM_OrientableSurface, both are included in the spatial model in S-100. If forward/reverse orientation cannot be encoded, referencing of curve spatial objects must be duplicated or otherwise complicated.
			The ISO 8211 format includes orientation fields and topology indicator for point association fields. GML convention is that orientation is determined by the order of coordinate values.
			Add relevant GML orientable types. Solution for TOPI field TBD
2	Data format	GML profile; S-100 extension schemas	Spatial objects can be associated to information objects in the S-100 Geometry model. The data quality model assumes these associations. They are also needed for proposed Level 3c spatial type encoding.
			GML association mechanism uses XML attributes to make the association and therefore allows at most one such association for geometry elements.
			Devise a workaround – extend format geometry, or use chains of information objects, etc.
3	Data format	S-100 extension schemas New Part 10b	Detailed guidance needed on dataset structure. Needs details such as order of object types, whether geometry is inline or "by reference", etc. Examples will clarify.
			Not in strict scope of a GML profile as defined by ISO
			Define dataset XML elements in extension XML schema. Prepare guidance and examples for application schema designers.
4	Data format	S-100 extension schemas	Defining spatial types which are not in the GML standard is not addressed.
			Not within scope of a GML profile and not in the current S-100 profile
			Prepare guidance for application schema designers. Prepare schemas for any extended spatial types approved by TSMAD. Permanent Internet location needed for such schemas.
5	Data format	New Part 10b	Complex attributes not addressed. They are encountered only when an application schema is being developed so different applications might take different approaches with resulting increase in complexity.
			Not in scope of GML profile. Complex attributes are a concept introduced in S-100. Not clear how ordinary relational database systems or GML tools will treat them.
			Add guidance in the new Part 10b.
6	Data format	TBD	Metadata not addressed.
			Action item for other TSMAD members for TSMAD 27.
			Await results and review effects on the GML profile, if any.
7	Data format	S-100 extension schemas	Update format not defined
			Not defined.

			Define, taking into account the WFS update format. Convertibility with ISO 8211 update format must be considered.
8	Data format	GML profile(?)	No profile for gridded data / coverages
			Not addressed
			Evaluate need and proceed accordingly.
9	Data format	New Part 10b	Feature and information associations, aggregations, and compositions.
			GML 3.3 associations
			Develop encoding rules for each. Must allow multiple associations.
10	Use, may need adaptation of data format	S-100 extension schemas Testbeds	Direct use of GML datasets for portrayal processing not considered.
			Not addressed, not strictly a GML profile issue; Portrayal XSL templates for S-101 or another S-10x product specification are still to be developed.
			'Paper' review of compatibility of GML data with portrayal. Build application schemas and datasets and test.
11	Support	Support tools	Equivalency between GML and ISO 8211 formats not determined. Mappings between ISO 8211 and GML constructs are yet to be established. E.g., feature encodings in the ISO 8211 format and GML have different structures; references in ISO 8211 are by means of record name and record identifier.
			Not strictly a GML profile issue.
			"Paper" review of mapping between GML and ISO 8211 data formats. Develop conversion tools, application schemas, sample datasets, and test.
12	Use	New Part 10b	Rule-based validation of XML data, e.g., for checking validity of conditional attributes.
			Not addressed, not strictly a GML profile issue.
			Develop examples and add guidance in S-100 Part 10b.
13	Support	S-100 extension schemas Supporting tools	XSD file generation from UML or the feature catalogue. Not strictly a matter for the S-100 profile, but a useful adjunct, and it's possible practical considerations may affect the profile.
			ShapeChange is an Enterprise Architect extension developed for INSPIRE which generates INSPIRE-compatible XSD schemas. It does not work with S-100 UML models because the general models differ.
			Adapt ShapeChange or develop a similar tool for S-100. This may be implemented with XSL templates processing XMI files generated by Enterprise Architect.

5   Conclusion

There are few gaps in the current GML profile taken in the sense of ISO 19136. Making the profile usable by S-100 specification writers and developers, facilitating cross-application and cross-domain commonality, and avoiding a proliferation of GML "idioms" all conforming to the profile, need some combination of additional constructs, schemas, rules, guidance, and informative material.

6   Actions Requested

TSMAD is requested to:

- note this paper;
- use this paper as input to the development of the S-100 GML profile;
- take appropriate further actions to address the issues noted.