TSMAD26/DIPWG5-11.7B

Paper for consideration by TSMAD

S-100 Geometries Progress

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Executive Summary:	This paper provides an update on extending S-100 with additional spatial types.
Related Documents:	(1) S-100 Ed. 1.0.0
Related Projects:	(1) S-100

1 Introduction/Background

TSMAD 25 assigned an action to produce a paper recommending how additional geometries defined in ISO 19107 can be added to S-100.This paper reports on progress of this item.

2 References

ISO 19107: Geographic Information – Spatial Schema

S-100: Universal Hydrographic Data Model, Edition 1.0.0, January 2010.

3 Discussion/Analysis

Some domains use geometries other than those included in Edition 1.0.0:

- Marine protected areas are sometimes defined as the area within a given radius seaward of a specified point.
- The AIS Application Specific Message for "Area Notice (broadcast)" uses circle and sector geometries (also rectangle, polyline, and polygon).
- Marine safety information messages or notices may designate circular areas in terms of centre and radius.

ISO 19107 defines several geometric primitives and coordinate geometries, ranging from point to polyhedral surface and splines. To these are added geometric aggregates and geometric complexes. S-100 Part 7 implements a subset of these which are theoretically sufficient to model necessary 0- 1- and 2-dimensional geometries though not all possible geometry types. S-100 also allows limited extension into a 3rd dimension.

Considerations relating to whether additional geometry types should be added are:

- Felt need – driven by factors such as use in source information (e.g., legislation or regulations) and expected use in applications and services especially e-navigation services and applications.
- Ease of implementation of specific additional geometry types.
- Consequences for data acquisition, conversion, and verification.
- Listing a geometry type in S-100 does not necessarily permit its use in a data product; individual product specifications can restrict types allowed in a product to a subset of those specified in S-100.
- Portrayal – portrayal technology may be able to handle some new types but not others, e.g., Scalable Vector Graphics (SVG) can create compact encodings of circles, elliptical and circular arcs, and cubic and quadratic Bézier curves.

If additional geometries are needed, should they be defined in S-100 and if so, how? The discussion below summarizes the alternatives:

A. Do nothing in the S-100 standard. Product specification writers decide if they need a new spatial type, and if they do, define it in the product specification. The advantages of this approach are reduction of the effort needed to prepare the next edition of S-100 and in allowing "just-in-time", custom definitions so specifications can define exactly what they need. The disadvantage is that specification writers will define exactly what they want, attributes that are actually spatial attributes might be treated as thematic attributes, and geometry types are less likely to be reused.

B. Add to S-100 incrementally: Specification writers propose new geometries as a "Change to S-100" and TSMAD approves. New clauses are added to S-100 Part 7 for each new spatial type. The advantage is that adding a new geometry becomes a "just-in-time" task. The disadvantages of custom-written specifications, mentioned in "Do nothing", remain. Also each accepted proposal is technically an extension of S-100 (§12-2.3) and so involves a new major version. Depending on the details of the addition perhaps even new metadata may be needed.

C. Include All ISO 19107: All the remaining ISO 19107 geometry types are added to S-100 edition 2.0.0, the additional ISO types being defined as a new level in Part 7. (Some from ISO 19136 i.e., CircleByCenterPoint might also be included). Further changes (including non-ISO geometries) are dealt with using one of the other approaches described in this section. The advantage is more standardisation, minimal revision of product specifications (because they should already be specifying one of the current levels) and fewer future S-100 change proposals. The disadvantage is that it front-loads effort (heavily, given the number of types in ISO 19107) in exchange for unpredictable benefits.

D. Geometry types register: A register of geometry types is added to the IHO registry, managed on the same lines as a domain – proposal, approval, etc. The only changes needed to S-100 should be to add description and a content model for this new register. The advantage of this approach is that it is a flexible process which still facilitates reuse, and requires no revision of existing product specifications. The disadvantage is that it complicates application schemas and product specifications somewhat.

E. Middle road: Add ISO 19107 and ISO 19136 additional geometries most likely to be needed to S-100, as a new spatial level or new conformance class, then follow one of the other approaches. The advantage is that it requires minimal revision of product specifications (they should already be specifying one of the existing levels) deals with the probable new geometries, is less work than including all ISO geometries, sets up a skeleton for future additions, and retains flexibility for the future. The disadvantage is that it is more immediate work than doing nothing, adding incrementally, or using a register.

Geometry types are being discussed with SNPWG and IALA and more should be known about use cases following those discussions.

4 Conclusion

This paper summarizes the state of progress on adding more geometry types to S-100. TSMAD is invited to discuss the ideas summarized here and continue the action item to TSMAD 27.

5 Actions Requested

TSMAD is invited to:

- note this paper
- continue the action item to TSMAD 27