Paper for Consideration by S-100WG8

Drafting the Part10b GML Data Format Implementation Guidance

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Executive Summary:	An update on progress drafting the implementation guidance for Part10b
Related Documents:	S-100 Part 10b
Related Projects:	

Introduction / Background
In S100WG6 (Jan. 2022), NTOU presented a paper entitled "Detected GML Issues Related to Spatial Reference Systems" which led to an action item to add an implementation guidance to S-100 Part10b GML data format. This paper reports the progress drafting the implementation guidance for S-100 Part10b.

Analysis/Discussion
Items to be included in the implementation guidance are to be further identified, while the contents depend very much on the standard documents which keep evolving as well as the decisions on remaining issues. Nevertheless, based on experience gained in IHO-SG S-131 database project and recent findings in sample/test dataset of some S-100 based data product specifications, the following parts have been prepared.

GML format dataset structure

| Elements	Remarks
S1xx:Dataset	The root element of the dataset. S1xx:DatasetType extends S100: DatasetType
gml:boundedBy	inherited by S100:DatasetType from gml:AbstractFeatureType; us3 gml:Envelope element to encode the coordinates of the lowerCorner and upperCorner of the extent.
S100:DatasetIdentification	a mandatory element defined in S100:DatasetType. (Which elements to be included is inconsistent across documents. It is also noted that several S-1xx sample datasets use the tag S100:DatasetIdentificationInformation instead of S100:DatasetIdentification)
S100:Geometry	allows spatial objects to be located outside feature objects. Group of allowed S-100 geometries, i.e. choice of Point, MultiPoint, curves (Curve, CompositeCurve, OrientableCurve), Surface, Polygon. For example, S100:Point
S1xx:members	group of information, feature and meta objects, all S1xx:Member Objects; S1xx:members extends gml:AbstractFeatureMemberType.

Coordinate Reference System
The coordinate reference system of the geometry is specified in the srsName attribute and URI convention should be used, which is http://www.opengis.net/def/crs/EPSG/0/4326 for EPSG code 4326 (i.e. WGS84 coordinate reference system).
The axis order in the formal definition of EPSG4326 is Lat/Long. When CRS is identified using OGC URI form "http://www.opengis.net/def/crs/EPSG/0/4326" or URN form "urn:ogc:def:crs:EPSG::4326", Lat/Long axis order is respected. However, if the srsName attribute is set to "EPSG:4326", the coordinates are mostly treated as in Long/Lat axis order in GIS. The following figure illustrates how a S-421 route plan[1] is wrongly displayed in QGIS due to the use of "EPSG:4326", and the correct display when replacing that with the URI form.
Specifying the srsDimension attribute is not required and not recommended, because it is implicit from the CRS identified by the srsName. EPSG4326 or WGS84 is a geographic 2D type by definition.

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[1] a test dataset referred to in IEC 63173-1: S-421 route plan based on S-100, Edition 1.0, June 2021.
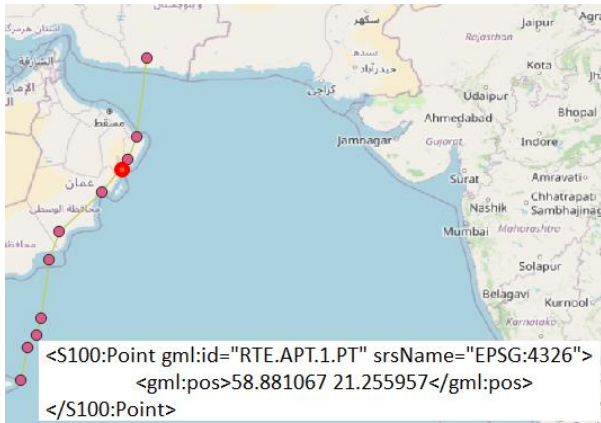
(a) original srsName encoding in the S-421 dataset
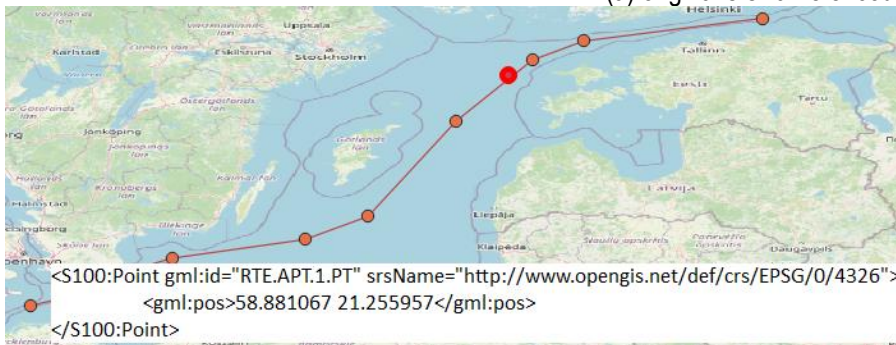
(b) corrected encoding

Fig.1 The risk of not using the standard form to encode coordinate reference system in the srsName attribute

Enumerations

For S-100 enumeration or S-100 codelist attributes, datasets must use the code and label of the listed value as encoded in the Feature Catalogue. The enumeration attribute type is defined as a complex type extending from the label type and including the code type as an xml attribute. See the example as follows.

Listed value of the numeration attribute type membership in S-1xx Feature Catalogue	Sample encoding in the S-1xx GML dataset
<S100FC:code>membership</S100FC:code> …. <S100FC:label>Included</S100FC:label> <S100FC:code>1</S100FC:code> .. <S100FC:label>Excluded</S100FC:label> <S100FC:code>2</S100FC:code>	<S1xx:membership code="1">Included</S1xx:membership>
	<S1xx:membership code="2">Excluded</S1xx:membership>

Conclusions and Suggestions

GML data format is being used by many S-100 based data product specifications, including those drafted and published by organizations other than IHO. Changes introduced during the revision of S-100 standard documents might not be easily noticed and reflected into the respective product specification. In addition to the implementation guidance, specifying corresponding validation check items might help to highlight changes and assure conformity.

Action required of S-100WG

The S-100WG is invited to:
    a)   Note this paper;
    b)   Take actions as appropriate.