

Paper for consideration by TSMAD

Modification of the Feature Catalogue

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Executive Summary:	This paper provides for the modification of the feature catalogue to reflect changes in the general feature model discussed at TSMAD 22. It also proposes additional changes to reflect the introduction of optional roles discussed at TSMAD25 and discusses the implications of adding context-specific aliases and numeric codes to the feature catalogue.
Related Documents:	(1) S-100 Ed. 1.0.0
Related Projects:	(1) S-100

1 Introduction / Background

The main motivation for the change in the feature catalogue model is compatibility with the changes to the general feature model discussed at TSMAD 22. The main change to the GFM from Edition 1.0.0 is that there are now two types of associations - feature and information associations - and associations can have thematic attributes. These changes are required for the modeling of nautical publications.

Further changes to the GFM resulted from making roles optional and using default roles as discussed at TSMAD 25 and the resulting changes to the feature catalogue are also described.

The addition of numeric codes and context-specific aliases to the feature catalogue has been mentioned earlier. This paper describes the implications of these changes without proposing to add them to the feature catalogue model.

In addition, redundant information was removed and other general cleanup was done.

2 Terms and Abbreviations

GFM	General Feature Model
URI	Uniform Resource Identifier
URN	Uniform Resource Name
XML	Extensible Markup Language

3 References

ISO 19110: Geographic Information – Methodology for Feature Cataloguing. (2005).

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

TSMAD22-DIPWG3-03D: Modification of the General Feature Model. Paper at TSMAD 22, April 2011.

TSMAD22-DIPWG3-03E: Modification of the Feature Catalogue Model. Paper at TSMAD 22, April 2011.

TSMAD25-4.3.2: Revisions and Extensions to S-100 Edition 1.0.0, 2013. Paper at TSMAD 25, Jan. 2013.

TSMAD26-??: Roles in S-100. Paper submitted to TSMAD 26.

4 Discussion

4.1 Modifications for association classes

The changes from the TSMAD 22 paper on modifications to the general feature model are implemented (reproduced from TSMAD22-DIPWG3-03E – changes in italics).

- Add a new class **S100_FC_Item** to carry the common properties of all feature catalogue items. Those were repeated in three classes of the old model. This is only a cleanup and does not

semantically change the model. (*Sentence about format depending on the requirements of the product specification removed from description of attribute code – Table A.4.*)

- The class **S100_FC_PropertyType** was removed from the model. Derived classes are now derived from **S100_FC_Item**. The reason for this is that the removed class does not add any information to the model.
- The classes **S100_FC_InformationRole** and **S100_FC_AssociationRole** were replaced by only one class **S100_FC_Role** due to the changes in the GFM. (There is only one role type in the GFM now).
- There is a super class for **S100_FC_FeatureType** and **S100_FC_InformationType**: **S100_FC_ObjectType**. The reason for this is the common property 'informationBinding'.
- A new class **S100_FC_InformationAssociation** was added to the model due to the change of the GFM.
- The classes **S100_FC_InformationAssociation** and **S100_FC_FeatureAssociation** are subject of inheritance now (to be in line with the GFM).
- The attribute 'permittedValues' of **S100_FC_AttributeBinding** was changed into an association. This is not a semantically significant change of the model.

Namespaces, class names, and classes from the feature concept dictionary package conform to those in the Enterprise Architect file used as the base for making the present updates. The additional changes resulting from updates to roles described at TSMAD 25 in the accompanying paper on roles are described in the next section.

4.2 Modifications for default roles and information association navigability

The following changes were made for default roles and bi-directional navigability of information associations.

- Multiplicity at the **S100_FC_Role** end of its associations with **S100_FC_InformationAssociation** and **S100_FC_FeatureAssociation** is changed to 0..2 from 1 and 2 respectively. Assuming default roles, this is not a semantically significant change to the model since the roles continue to exist as defaults if not explicitly named.
- Language in TSMAD22-DIPWG3-03E for **S100_FC_InformationAssociation** about information associations being unidirectional is removed. This has the effect of making bi-directional navigability permissible but not required.
- Language is added to § 5-4.2.3.5 and § 5-4.2.4 stating that one or both of the role names for an association may be a default.

The effect is that the role names continue to be in an application model but in the interest of compactness every single role for every single association need not be mentioned in the feature catalogue. Feature catalogues are permitted to specify all roles, including default roles.

Product specifications may restrict their application schemas to use only uni-directional links from feature types to information types if desired. A clarifying remark to this effect is added in the documentation of **S100_FC_InformationAssociation**.

4.3 Context-specific aliases and numeric codes

Other changes were discussed around TSMAD22 and later to: (i) add an attribute for numeric codes, and (ii) augment aliases with contexts. "Alias" in the TSMAD22 paper is a string attribute of **S100_FC_Item**. An alternative is to provide an optional context for each alias, i.e., use a structured type **S100_FC_Alias** containing the **value** of the alias and (optional) **context**. Proposals for **S100_FC_Alias** and **numericCode** are shown in Figure 1.

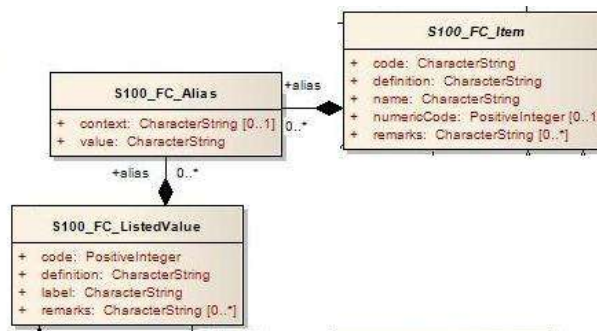


Figure 1. Proposal for context-specific aliases and numeric code

Considerations for **S100_FC_Alias** and attribute **numericCode**:

- Data formats (encodings) may have specific requirements for type identifiers, e.g., ISO 8211 numeric codes, ISO 8211 4-letter field/subfield labels, XML tags. If data formats use identifiers different from values of attribute **code** of **S100_FC_Item**, it is necessary to make unambiguous links between such format-specific identifiers and feature/information types and enumeration members in the feature catalogue. **S100_FC_Alias** and **numericCode** enable such links (the latter targeted to ISO 8211 encoding).
- The scope of an alias or numeric code defined in a feature catalogue is the product specification of which it is part. Other product specifications might use any given alias for another item. Some values of **numericCode** in the S101 feature catalogue will almost certainly be reused elsewhere.
- A product specification implicitly defines a context. Refinement of the context is needed only if it is necessary to define a lower level of contexts within the original context. The sub-contexts of a hypothetical S-100 product are (i) different types of applications and (ii) different delivery modes. Both types of sub-context are relevant to aliases and numeric codes only because they may use different encodings of the same data.
- Numeric codes for ISO 8211 encoding are equivalent to **S100_FC_Alias** instances with context "S100 ISO 8211 encoding". Numeric codes can therefore be subsumed into **S100_FC_Alias**.
- Standardized **context** values might be developed into a system of persistent identifiers for marine services, service portfolios, encoding formats, etc.
- Including **S100_FC_Alias** in the feature catalogue makes it slightly easier for a software tool to generate XML schemas, SQL queries, etc., from XML feature catalogues or UML application schemas.
- Aliases in general might be useful for GIS, web search tools, and mappings to other classification schemes.
- The S-100 feature catalogue model should not include information required only for specific data format definition requirements. If format-specific information is included feature catalogues will increase in size and complexity.
- According to the current product specification template an updated feature catalogue implies a revision of a product specification. This implies the product specification would have to be re-issued with an incremented revision number (N.n.0) when a second (third, fourth, etc.) encoding format is defined. On the other hand it can be argued that a new encoding format merits an incremented revision number.
- XML feature catalogues may be bundled as-is with applications, so the effects on OEM updating of applications, application loading, and space needed especially in computer memory should be considered. At the least, OEMs may have to strip feature catalogues of aliases the application does not use.
- Alias declarations can be separated from feature catalogues by providing mappings from feature catalogue entries to format-specific tags, codes, or type names, tables in the "Data Format" section of a product specification. An XML format for these maps can be defined. It should be possible to adapt schema generation software (e.g., ShapeChange) to use these XML maps but

it makes the schema generator a little more complex (and their code must be available for adapting, though this should not be a problem for ShapeChange).

Since numeric codes are driven entirely by data format requirements, are of narrow applicability, have no other known use, and can be subsumed into **S100_FC_Alias**, **numericCode** need not be included in the S-100 feature catalogue model. There is a stronger case for **S100_FC_Alias**, which is more flexible, but there are also disadvantages. TSMAD22-DIPWG3-03E included neither and neither has been added to the feature catalogue model in the accompanying markup of Part 5.

5 Recommendations

The following specific recommendations are made.

- update the feature catalogue model and documentation in Part 5 as summarized in Section 4.1 to conform to the changes to the GFM agreed at TSMAD22;
- add the modifications for flexible roles and associations summarized in Section 4.2.

Changes to S-100 are redlined in the accompanying markup of Part 5.

6 Justification and Impacts

Justification: The changes to the GFM were needed to increase flexibility for modeling (especially for nautical publications and domains other than ENCs), minimize clutter and complexity in UML models, reduce data storage requirements, and bring S-100 into closer alignment to ISO 191xx standards. Failure to include them will make the development of application schemas more difficult. The changes to the feature catalogue are necessary to keep the feature catalogue consistent with the updated GFM.

Impacts: Impacts on data products, production, and applications are minimal since S-100 data products have yet to be produced. The FC XML schema will need to be updated and the feature catalogue builder and convertor will need to use the updated FC model/schema. Product specifications under development will have to state the conventions they use for default and optional roles.

7 Actions Requested

TSMAD is invited to:

- Endorse the recommended changes to S-100
- Discuss the issue of numeric codes and aliases and determine whether or not to include them.