Paper for Consideration by the S-101PT10

Use of roles in the feature catalogue

Submitted by:	SevenCs GmbH
Executive Summary:	Proposal for the use of roles in the feature catalogue
Related document(s):	S-101 FC 1.1.0

Introduction / Background

In the S-101 FC 'information bindings' and 'feature bindings ' are used to define information associations and feature associations. Information associations define the relationship between an arbitrary object and an information type instance. Feature associations are defining the relationship between instances of a features type and another instance of a feature type.

In the feature catalogue those associations are defined by:

- The code of the target information type or feature type
- The code of the information association / feature association
- The code of the role that applies to the target object.
- The multiplicity (How many target objects of the given type can be related).
- The role type (association, aggregation, or composition)

We have observed that the code of the roles is used inconsistently.

Analysis/Discussion

The discussion will be based on an example without the loss of generality.

The example is a 'Bridge' feature with a feature association to a 'SpanFixed' feature type and an information association to a 'NauticalInformation' information type.

The UML diagram shows the model.
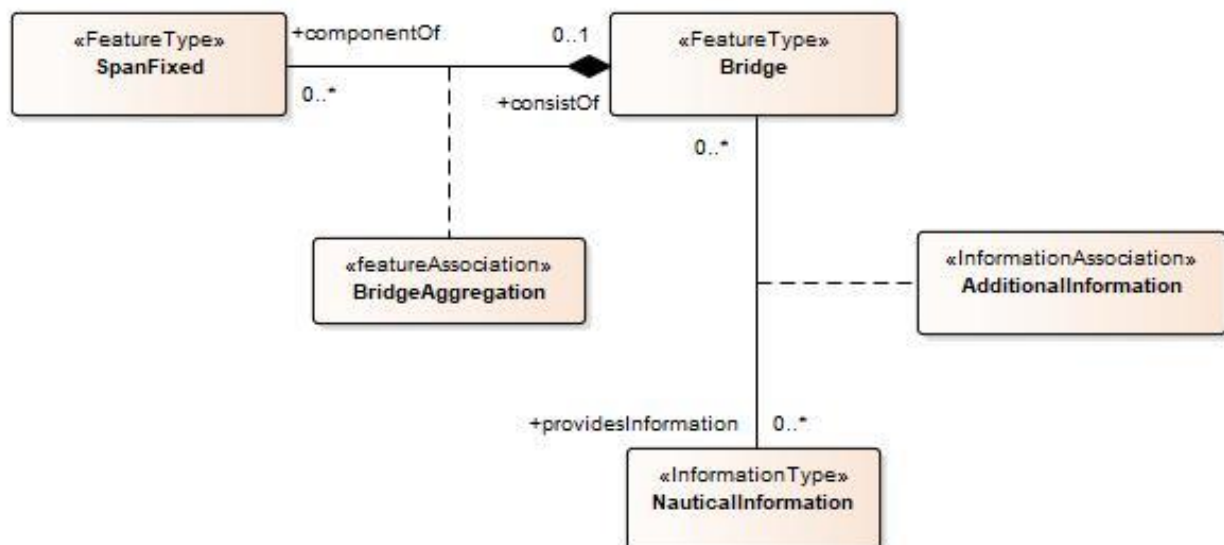
This is the way it must be interpreted:

- Feature association
    - An instance of a *Bridge* feature type can have zero to many associations to (different) instances of the *SpanFixed* feature types using the Feature association *BridgeAggregation*.
    - The role of the *SpanFixed* in this association is *componentOf*
    - The role of the *Bridge* is *consistsOf*.
    - A *SpanFixed* can be either associated with one *Bridge* or with no *Bridge* (not with many, for obvious reasons). (I personally think that a SpanFixed cannot exists without being part of a *Bridge*, but this is a different discussion)

- Information association
    - An instance of a *Bridge* feature type can have zero to many associations to (different) instances of the *NautilcalInformation* information type using the information association *AdditionalInformation*
    - The role of the *NautilcalInformation* in this association is *providesInformation*.
    - The role of the Bridge in this association is not explicitly given but implicitly defined. It is the other role defined in the Information Association. (*informationProvidedFor*)
    - Each *NauticalInformation* instance can be associated to many *Bridge* instances but does not have to. (0..*)

Inconsistent use of association roles in Feature catalogue

It has been noticed that in S-101 FC 1.1.0 (and previous versions) the roles of the associations are not used in a consistent manner. While information bindings use the association roles correctly - i.e. to describe the **function of the referenced item**, feature bindings use the association roles incorrectly – they describe the **function of the main feature**.

In the following this is described in more detail.

1. Definition of feature type *Bridge* in the Feature Catalogue (FC 1.1.0) – **informationBinding**

```
−<S100FC:S100_FC_FeatureType isAbstract="false">
   <S100FC:name>Bridge</S100FC:name>
  −<S100FC:definition>
      (1) An elevated structure extending across or over the weather deck of a vessel, or
      water, railroad, etc., to provide a roadway for vehicles or pedestrians.
   </S100FC:definition>
   <S100FC:code>Bridge</S100FC:code>
  −<S100FC:remarks>
      A bridge may consist of portions which cover the land and the water.
   </S100FC:remarks>
   <S100FC:alias>BRIDGE</S100FC:alias>
  −<S100FC:definitionReference>
      <S100FC:sourceIdentifier>215</S100FC:sourceIdentifier>
      <S100FC:definitionSource ref="IHOREG"/>
   </S100FC:definitionReference>
   +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
   +<S100FC:attributeBinding sequential="true"></S100FC:attributeBinding>
```

```
   +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
   +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
   +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
  −<S100FC:informationBinding roleType="association">
     −<S100FC:multiplicity>
        <S100Base:lower>0</S100Base:lower>
        <S100Base:upper xsi:nil="false" infinite="false">1</S100Base:upper>
     </S100FC:multiplicity>
      <S100FC:association ref="AdditionalInformation"/>
      <S100FC:role ref="providesInformation"/>
      <S100FC:informationType ref="ContactDetails"/>
      <S100FC:informationType ref="NauticalInformation"/>
      <S100FC:informationType ref="NonStandardWorkingDay"/>
      <S100FC:informationType ref="ServiceHours"/>
   </S100FC:informationBinding>
   <S100FC:featureUseType>geographic</S100FC:featureUseType>
   +<S100FC:featureBinding roleType="association"></S100FC:featureBinding>
```

In the S-101 FC the definition of the feature type **Bridge** has associations of types **AdditionalInformation**. Valid information types are **ContactDetails, NauticalInformation, NonStandardWorkingDay, ServiceHours** and the role for all of them is **providesInformation**.

This must be interpreted as follows:

A **Bridge** feature can reference an information type **NauticalInformation**.

The referenced item (**NauticalInformation**) **providesInformation** for the main feature (i.e. Bridge).

Please note:

> here the role describes the function of the **referenced** feature:
>
> NauticalInformation providesInformation

This complies with the UML model above.

2. Definition of feature type *Bridge* in the Feature Catalogue (FC 1.1.0) - **featureBinding**

```xml
</S100FC:S100_FC_FeatureType>
−<S100FC:S100_FC_FeatureType isAbstract="false">
  <S100FC:name>Bridge</S100FC:name>
  −<S100FC:definition>
     (1) An elevated structure extending across or over the weather deck of a vessel, or part of su
     water, railroad, etc., to provide a roadway for vehicles or pedestrians.
  </S100FC:definition>
  <S100FC:code>Bridge</S100FC:code>
  −<S100FC:remarks>
     A bridge may consist of portions which cover the land and the water.
  </S100FC:remarks>
  <S100FC:alias>BRIDGE</S100FC:alias>
  −<S100FC:definitionReference>
     <S100FC:sourceIdentifier>215</S100FC:sourceIdentifier>
     <S100FC:definitionSource ref="IHOREG"/>
  </S100FC:definitionReference>
  +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
  +<S100FC:attributeBinding sequential="true"></S100FC:attributeBinding>
  +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
  +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
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  +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
  +<S100FC:attributeBinding sequential="false"></S100FC:attributeBinding>
  +<S100FC:informationBinding roleType="association"></S100FC:informationBinding>
  <S100FC:featureUseType>geographic</S100FC:featureUseType>
  +<S100FC:featureBinding roleType="association"></S100FC:featureBinding>
  +<S100FC:featureBinding roleType="composition"></S100FC:featureBinding>
  +<S100FC:featureBinding roleType="association"></S100FC:featureBinding>
  +<S100FC:featureBinding roleType="association"></S100FC:featureBinding>
  −<S100FC:featureBinding roleType="aggregation">
     −<S100FC:multiplicity>
        <S100Base:lower>0</S100Base:lower>
        <S100Base:upper xsi:nil="true" infinite="true"/>
     </S100FC:multiplicity>
     <S100FC:association ref="BridgeAggregation"/>
     <S100FC:role ref="consistsOf"/>
     <S100FC:featureType ref="PylonBridgeSupport"/>
     <S100FC:featureType ref="SpanFixed"/>
     <S100FC:featureType ref="SpanOpening"/>
  </S100FC:featureBinding>
  +<S100FC:featureBinding roleType="composition"></S100FC:featureBinding>
```

In the S-101 FC the definition of the feature type **Bridge** has an association of type **BridgeAggregation**. Valid referenced feature types are **PylonBridgeSupport, SpanFixed, SpanOpening** and the role for all of them is **consistsOf**.

This must be interpreted as follows:

A **Bridge** feature can reference a feature of type **SpanFixed**.

The main feature (i.e. **Bridge**) **consistsOf** the referenced item (**SpanFixed**).

Please note:

> here the role describes the function of the main feature (not the function of referenced item):
>
> Bridge consistsOf

This does **not** comply with the UML model above.

Conclusions

The roles in information associations and feature associations in the current version of the S-101 FC are defined in an inconsistent way. We think that for all feature associations the used roles are not correct and should be replaced with the (opposite) role of the association.

Side note:

One source of the problem might be that the syntax of role names is not consistent (e.g., *information provided for, provides information; updates, identifies; component of, consists of;* etc). Currently role names do not follow a defined structure - they are formed by different kinds of verb types (intransitive, transitive, linking, or passive verbs) or nouns. This may cause confusion.

Recommendations

We strongly recommend correcting the feature bindings for the next version of the S-101 Feature catalogue and consider introducing a defined syntax for role names.

Action Required by the S-101PT

The S-101PT is invited to:

    a. Note this paper
    b. Discuss the paper
    c. Endorse the proposed changes