Paper for Consideration by S-101 Project Team

Fairways model DCEG Proposals

Submitted by:	Jeppesen
Executive Summary:	This paper proposes adding a feature type to aggregate fairway features and associations to link related navigation aids, etc., to fairways.
Related Documents:	none
Related Projects:	IHI GI Register and S-101 Feature Catalogue

Proposal Type

Type of Change Requested	Mark All that Apply
S-101 DCEG Change	
New/Amended Feature	X
New/Amended Complex Attribute	
New/Amended Simple Attribute	
New/Amended Information Type	
New/Amended Association/Aggregation/Composition	X
New/Amended Enumerate Value	

New Fairway aggregation feature

In the S-57 standard (Appendix B.1 Use of Object Catalogue – clause 10.4) a collection object C_AGGR or C_ASSO may be created to relate FAIRWY objects with the navigational aids, recommended tracks, dredged areas, etc. Also, S-57 permits FAIRWY objects to be aggregated with other FAIRWAY objects to describe a long fairway with many bends though this is not specifically described in the S-57 UOC.

The S-101 DCEG does not describe any similar aggregations or associations with feature type Fairway. We cannot describe a long fairway consisting of many bends as one named aggregation. Experience of data encoding indicates a continued need for aggregating fairway features. If there is a long fairway consisting of a lot of bends they should be aggregated in one collection object.

Also, we cannot currently associate navigational aids, recommended tracks, dredged areas, and other regulated areas with fairways to which they are related.

This paper proposes a new aggregation feature **Fairway System** to link sections of fairways. Component **Fairway** features are associated to **Fairway System** by an UML aggregation relationship. Related features such as relevant navigation aids are associated to either **Fairway System** or to the current **Fairway** feature using an UML association relationship[1].

Another question was whether the auxiliary features should be associated to the new **Fairway System** aggregation feature, this proposal provides for it. They may also be associated to individual Fairway features since not all **Fairway** features may be part of a **Fairway System** aggregation.

Auxiliary features of **Fairway** are those features which demarcate or define the current **Fairway** feature instance, i.e. Range system for bends, light sector or direction light, lateral marks. Other features that

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[1] In principle they ought to be two different associations since they are theoretically different and UML treats them as different associations, but they are functionally similar and there is precedent in S-101 (e.g., the Structure/Equipment association).

are common, supplementary, or do not refer to specific fairway characteristics such as bends should be associated with the aggregation feature **Fairway System**.

Recommendations:
(A) Add a new Fairway System feature type to aggregate multiple Fairway features;
(B) Define an association or associations allowing fairway features to be associated to:
- Navigation aid features
- Recommended tracks
- Recommended route centerline
- Range System
- Swept area
- Dredged area
- Caution Area
- Restricted Area

New feature type for aggregations of Fairway features:

IHO Definition: **FAIRWAY SYSTEM:** Aggregation of connected fairway features making up a complex fairway system. (IHO).

S-101 Geo Feature: Fairway System

Primitives: none

Real World	*Paper Chart Symbol*	*ECDIS Symbol*
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S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Feature name			C	0,*
Display name			S (BO)	0,1
Language		(ISO 639-3)	S (TE)	0,1
Name	(OBJNM) (NOBJNM)		S (TE)	1,1
Fixed date range			C	0,1
Date end	(DATEND)	See clause 2.4.8	(S) DA	0,1
Date start	(DATSTA)	See clause 2.4.8	(S) DA	0,1
Periodic date range			C	0,*
Date end	(PEREND)	See clause 2.4.8	(S) DA	1,1
Date start	(PERSTA)	See clause 2.4.8	(S) DA	1,1

Feature associations

Type	Association Name	Association Ends					
		Class	Role	Mult.	Class	Role	Mult.
Aggregation	FairwayAggregation	Fairway System (T)	componentOf	0..1	Fairway (S)	consistsOf	2..*

| Association | FairwayAuxiliary | Fairway System | auxiliaryTo | 0..* | Navigation aids, Recommended Track, Recommended route centreline, Range System, Swept area, Caution Area, Restricted Area, Dredged Area | hasAuxiliary | 0..* |

INT 1 Reference: none

X.X.X Fairway systems (see S-4 – B-YYY.Y)

Fairway systems are composed of two or more Fairway features and are used where for complex fairways, for example to encode long fairways with several bends. The fairway system consists of multiple sections each encoded as a Fairway feature.

X.X.X Auxiliary features for a Fairway System

Other related features which provide additional information related to the fairway system but are common or do not refer to specific characteristics of a Fairway feature (such as specific bends, etc.) are auxiliary features.

Remarks:
- There is no requirement that the components form a connected graph.

- Related features associated with a Fairway will usually not be also associated with a Fairway System of which the Fairway is a component.

Distinction: none

New associations for Fairway and Fairway System features

In 15.7 Fairways, add associations to navigation aids, recommended tracks, and dredged areas and a remark to describe the auxiliary features:

Type	Association name	Association Ends					
		Class	Role	Mult.	Class	Role	Mult.
Association	FairwayAuxiliary	Fairway	auxiliaryTo	0..*	Navigation aids, Recommended Track, Recommended route centerline, Range System, Swept area, Caution Area, Restricted Area, Dredged Area	hasAuxiliary	0..*

Remarks:
X.X.X Auxiliary features
Auxiliary features of the Fairway feature are those features that form and define the current Fairway feature instance, i.e. Range system for bends, light sector or direction light, lateral marks.

Definitions of the new associations:

Fairway Aggregation:	IHO Definition: Collection of related fairways comprising a fairway system. (IHO).		
Remarks: • There is no requirement that the aggregated fairways form a connected graph.			
Role Type	**Role**	**Features**	**Multiplicity**

| Aggregation | componentOf | Fairway System (T) | 0..1 |
| | consistsOf | Fairway (S) | 2..* |

Fairway Auxiliary: IHO Definition: Association of navigation aids and other objects which mark boundaries, indicate recommended tracks or cleared depths, or otherwise provide additional information about fairway systems or individual fairway features. (IHO).

Remarks:
• There is no requirement that the aggregated fairways form a connected graph.

Role Type	Role	Features	Multiplicity
Association	auxiliaryTo	Fairway System, Fairway	0..*
	hasAuxiliary	Navigation aids, Recommended Track, Recommended route centerline, Range System, Swept area, Caution Area, Restricted Area, Dredged Area	0..*

Definitions of new roles:

Auxiliary to: IHO definition: Provides incidental, secondary, or supplementary information related to the referenced object.

Remark: The "referenced object" means the class at the association end for which this is the role name.

Has auxiliary: IHO definition: Incidental, secondary, or supplementary information is available in the referenced object.

Remark: The "referenced object" means the class at the association end for which this is the role name.

Justification and Impacts

The recommended changes restore encoding functionality that was possible in S-57 but omitted from S-101 and whose restoration is believed to be necessary based on data encoding experience.

Action Requested of S-101 Project Team
The S-101 Project Team is invited to:

a.   discuss the above proposals

b.   agree to their inclusion in the DCEG and proposal to the IHO FCD (if applicable) and to amend the S-101 Feature Catalogue