

**11th CHRIS MEETING
IHB, Monaco, 16-18 November 1999**

**Liaison Report to ISO/TC 211 from the International Hydrographic Bureau (IHB)
to the 9th plenary, Kyoto, Japan, 29-30 September 1999**

by Rear Admiral Neil GUY, IHB Director

ORGANIZATION

The International Hydrographic Bureau (IHB) in Monaco, is the Secretariat of the International Hydrographic Organization (IHO). The IHO is an intergovernmental organization that presently comprises 67 Member States represented by their Hydrographic Offices (HOs). Additionally, application for IHO membership by approximately 10 states is pending. Most of the major coastal states are members of the IHO.

SCOPE

The main objective of the HOs is to provide the Mariner with adequate cartographic tools so as to ensure safe navigation, e.g. nautical charts, in paper or digital form, sailing directions, and lists of lights. The IHO provides a forum to achieve standardization regarding the collection, management and presentation of hydrographic data. With the advent of the digital era and, in particular, the increasing importance of electronic charts, the IHO has focused in recent years on the development of standards required for the implementation of ECDIS (Electronic Chart Display and Information System). The standardization effort covered the display aspects and chart content of ECDIS (IHO Publication S-52 and its three appendices), and the transfer of hydrographic data (IHO Publication S-57).

TRANSFER STANDARD

The IHO Transfer Standard S-57 is intended to support the exchange of vector (and later raster and matrix) hydrographic data among producers and users. It comprises a theoretical data model, on which the standard has been based, a description of the data structure, and a catalogue of objects. In the data structure, provision has been made for the encoding of chart updates. Additionally, S-57 includes a product specification for ENC. Edition 3.0 of S-57 was published in November 1996.

S-57 has been frozen from November 1996, with a view to allowing HOs to produce ENC data conforming to Edition 3.0 and ECDIS manufacturers to market their systems. Changes to the Standard, which do not invalidate the already developed software for ECDIS, are promulgated from time to time through a cumulative Maintenance Document (MD) that is available from the IHO Website (<http://www.iho.shom.fr>).

A limited new edition 3.1 of S-57, which will only include minor changes to the Standard (some additional values in the Object Catalogue), has been planned for November 2000. A provisional version will be made available for evaluation to a selection of users in November 1999. The next major edition of S-57 is not planned before the year 2002. It should be noted that an Electronic Navigational Chart (ENC), based on S-57, is a legal tool and that any changes to the Standard should be made in such a way so as to not jeopardise the safety of navigation at sea.

PRODUCTION OF ELECTRONIC NAVIGATIONAL CHARTS

During the past year, focus has been on the production of Electronic Navigational Charts (ENC) by IHO Member States. The ENC is a legal product, recognised by the International Maritime Organisation, which must conform to S-57 and meet its ENC Product Specification. An official ENC service for Europe started on 1 July 1999 and is operated by a government sponsored organisation called PRIMAR (www.primar.org), which is based in Stavanger, Norway. PRIMAR organises the packaging and delivery of ENCs and their updates to the end users, on behalf of the European Hydrographic Offices. Other countries where official ENC data is also available include Japan, Canada, Australia, USA and Russia.

S-57 ALIGNMENT WITH TC211

The IHB endeavours, through the IHO CHRIS (Committee on Hydrographic Requirements for Hydrographic Systems), to draw the attention of HOs to the importance of the standardization work being undertaken within TC 211. The specific Work Items of interest to the IHO include : Feature cataloguing methodology, Profiles, Spatial schema, Spatial referencing by coordinates, Services, Metadata, Portrayal, Functional Standards, Quality principles, Quality evaluation procedures, and Encoding.

The IHB is aware of the importance of aligning S-57, and possibly other IHO standards, with TC211 standards, and is positively considering the issue. However support for moving in that direction must first be obtained from IHO Member States and the process may take some time. In this regard, the IHO may consider the establishment of a cooperative agreement with TC211 and, possibly, OGC. At the past meeting of the IHO TSMAD (Transfer Standard Maintenance and Application Development Working Group), which took place in June 1999, it was decided that the WG should investigate making the next major edition of S-57 a profile of the TC211 standards. This will require the adoption of UML as the modelling language. As a preliminary step, the S-57 OMT data model has been redefined in UML and is submitted in a separate paper for review and comments by WG5 of TC211.

The proposed actions requested of TC211, as in the attached submission, are recalled hereafter:

- to review the enclosed UML data models as input to the TC211 Functional Standards report;
- to consider the S-57 requirements in the development of modules in ISO 15046.

Monaco, 8 September 1999

**International Organization for Standardization
Technical Committee TC211 and
TC211 / WG5 and WG2**

Date : August 1999

Source : International Hydrographic Organization

Title:

**S-57 Data Model Represented terms of TC211
Abstract**

This paper presents the data model of S-57 represented in terms of the ISO TC211 Spatial Schema ISO 15046-7 and the General Feature Model from ISO 15046-9, using the UML modelling language. The representation of the S-57 model in terms of TC211 and in UML will assist harmonization between ISO and IHO. This representation is proposed to be used in S-57 edition 4.0 when it is prepared in 2002.

1. Introduction

The IHO TSMAD has worked for many years to harmonize its data model with that of DIGEST. This has been successfully accomplished in S-57 edition 3.0 and DIGEST 2.0. The last remaining difference was aligned in February 1999 in the DGIWG DIGEST meeting when DGIWG indicated support for a sounding type Feature (Object) that encompasses multiple nodes. The DIGEST and S-57 vector data models are now aligned.

The ISO has been developing a set of generic geographic information standards, the ISO 15046 series that define generic models, and components and establish rules for all areas of geographic information. IHO views the intent as not to displace standards such as S-57, but to provide common elements that can be used in more domain specific standards such as S-57. S-57 has been identified by ISO as an international Functional Standard along with DIGEST and the ISO TC204 GDF standard for road vehicle navigation.

There are many aspects of the TC211 work that directly apply to the task of the IHO TSMAD. One in particular is the data model. Currently Part 2 of S-57 is a description of the data model of S-57 expressed in terms of the OMT modelling language. This OMT model is a relatively high level, yet it provides the basis of the rest of the S-57 standard.

The ISO 15046-7 Spatial Schema and the 15046-9 General Feature Model are broader standards that address virtually all types of vector based geographic information. Several UML packages are defined that include the four models defined in S-57 together with others such as topology only maps (for subway systems), and three dimensional structures. The current data models used from the functional standards were examined by ISO and the S-57 models are included.

The ISO 15046-7 and 15046-9 standards are going through their editing stage toward becoming an ISO Draft International Standard (DIS). Currently the defined objects and relationships within the ISO standard are sufficient to represent S-57. Predefined modules need to be developed as part of the ISO standard that will be worked out cases directly equivalent to the S-57 and DIGEST data models. The IHO TSMAD wishes to ensure that the modules corresponding to S-57 do, in fact, represent S-57.

2. Data Models

The S-57 data model is feature based. An object consists of a feature component and a spatial component. This spatial component describes location in terms of geometry, topology and a geographic reference system that defines the coordinate system. Four levels of topology are defined in the S-57 vector model:

- Cartographic spaghetti
- Chain-node
- Planar graph
- Planar graph with faces (Full topology in 2D)

These four levels of topology in effect define four different data models. These four models are represented in terms of TC211 Spatial Schema and the Rules for Application Schema General Feature Model in the following four figures. The Point Feature, Line Feature and Area Features are S-57 Geo Feature Objects, and the Complex Feature implements the aggregation of Geo Feature Objects. The Collection Object which describes the relationship between other objects is represented by the Feature to Feature Relationship.

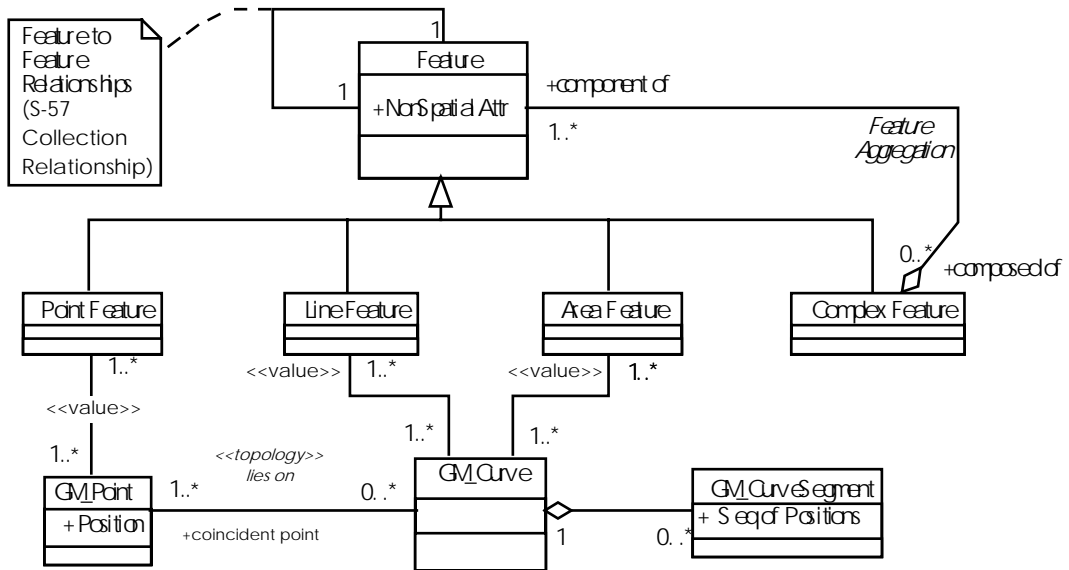


Figure 1: The S-57 spaghetti vector data model using 15046-7 classes.

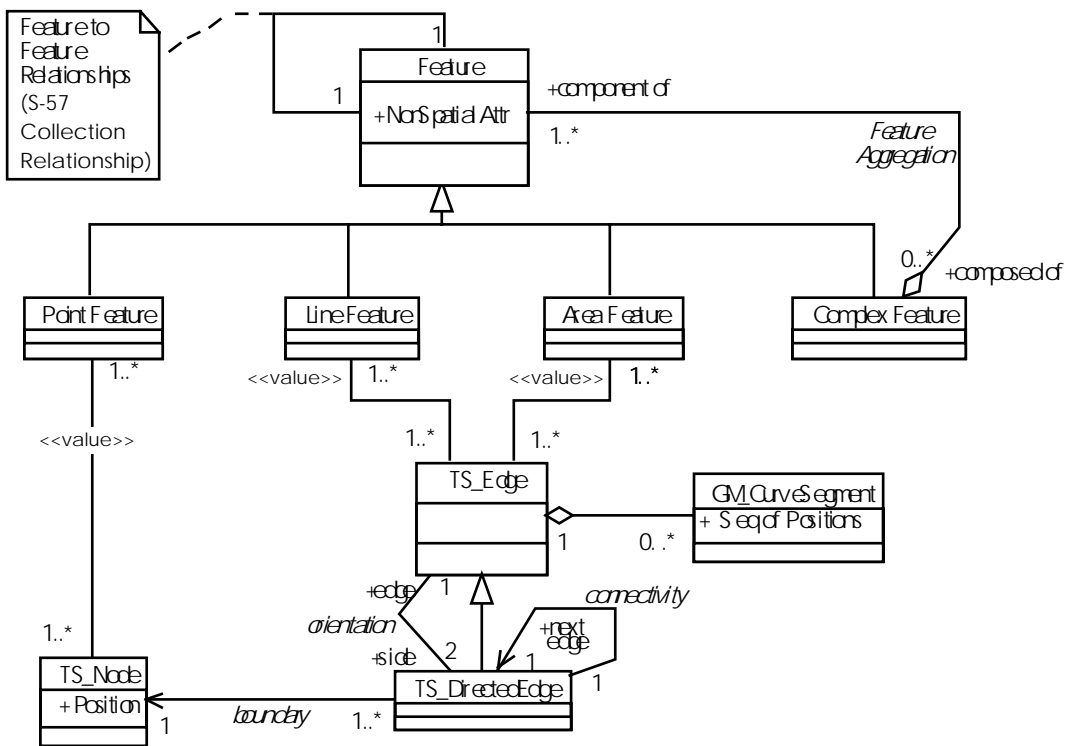


Figure 2: The S-57 chain-node vector data model using 15046-7 classes.

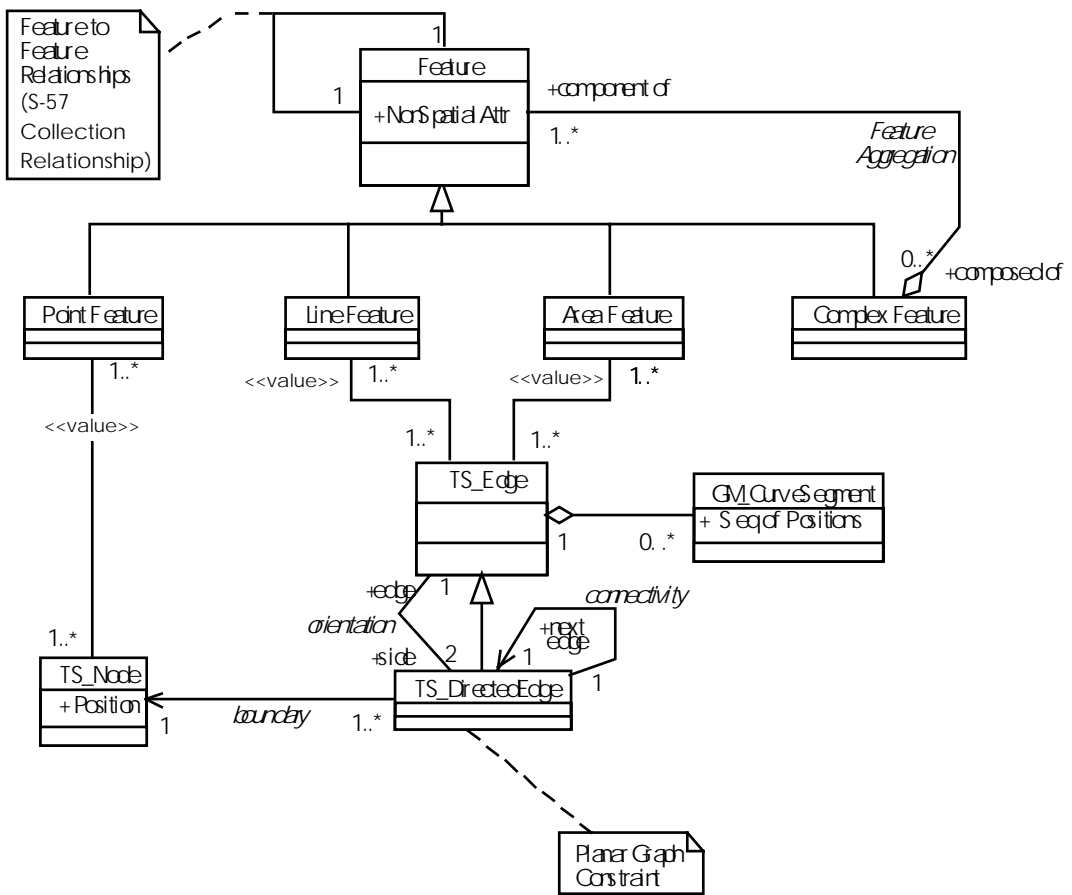


Figure 3: The S-57 planar-graph vector data model using 15046-7 classes.

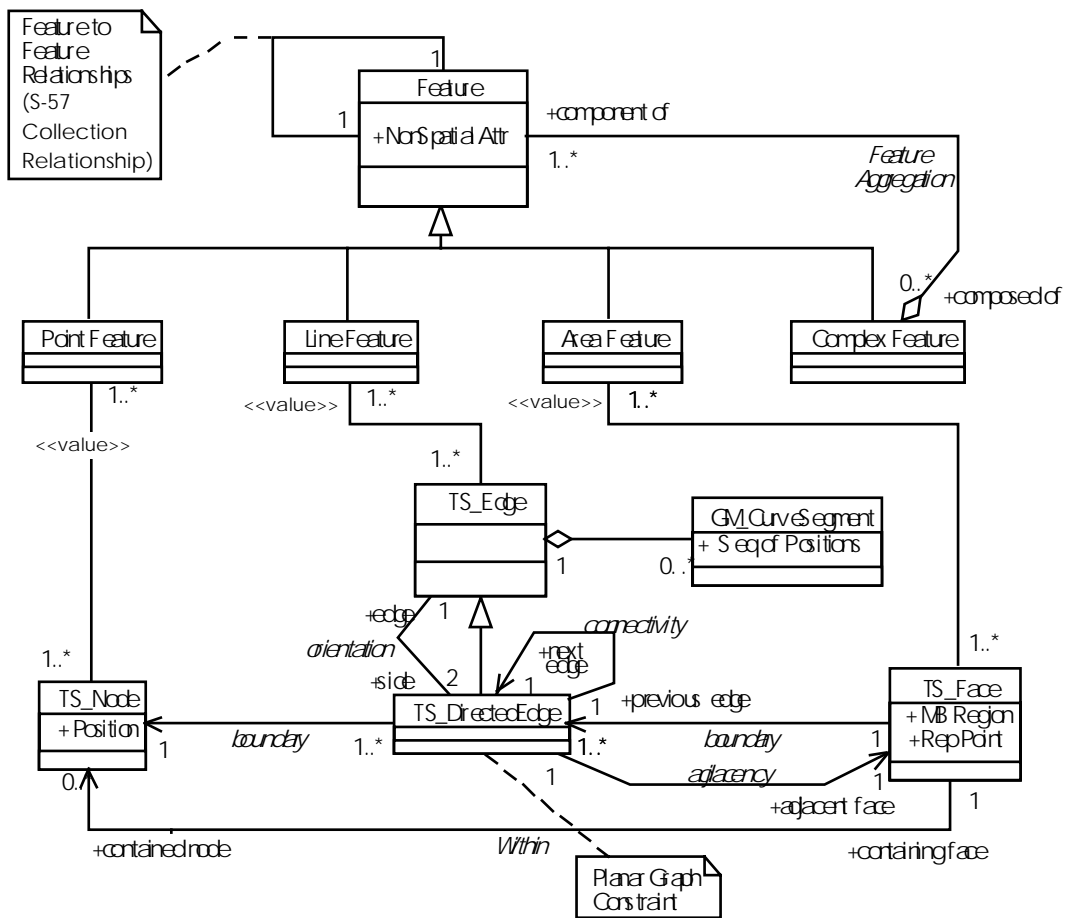


Figure 4 : The S-57 full 2D topology vector data (planar graph + faces) model using 15046-7 classes.

The implementation of these data models does not require the same number of elements as is shown in the models. Some S-57 records in ISO 8211 encode several of these elements.

3. Modules

The ISO TC211 standard on Profiles (16046-6) encourages the other parts of 15046 to define modules. Modules are effectively pre-established instantiations of the rules and selections of the components to create packages that can be easily constructed into profiles. The four data models defined above have already been proposed as four predefined TC211 spatial schema modules. This parallels the proposal from DGIWG to TC211, since the DIGEST data models and the S-57 data models are harmonized.

4. Profiles

The TC211 standards are implemented through profiles. A profile consists of a selection of modules or components from the various TC211 standards, together with an instantiation of the TC211 rules based standards. IHO is considering expressing S-57 edition 4 as a profile or profiles of TC211. This is planned to be done in an upwardly compatible manner without changing any of the technical content of the S-57 standard.

By establishing S-57 as a profile of TC211, IHO will be able to import new components into S-57 to address applications such as time varying objects and raster. ISO TC211 is currently working on the development of standards for Image and Gridded Data and Coverages and is planning work on Spatio-Temporal. Working in cooperation with TC211 will benefit both organizations.

5. Proposed Actions

The IHO requests ISO TC211 to review the data models included in this paper as input to the TC211 Functional Standards report.

IHO also requests that TC211 consider the IHO S-57 requirements in the development of modules in ISO 15046.

IHO is considering the development of an Internationally Standardized Profile of TC211 corresponding to S-57.
