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Status Report on Inland ENC Development and Standardization

Submitted by:	North American – European Inland ENC Harmonization Group (IEHG)
Executive Summary:	This paper reviews the current status of Inland ENC development and the ongoing initiative to harmonize Inland ENC Standards between North America and Europe. For the harmonization effort, it was agreed that an international Inland ENC Content/Product Specification include all IHO S-57 features that are relevant for Inland ENCs, as well as any additional real-world features that are needed for Inland ENCs (i.e., not contained in the "maritime" ENC Product Specification). It is intended that the Inland ENC Product Specification be suitable for all regions of the world. This is being accomplished via the development of a harmonized Inland ENC Encoding Guide that will become the framework for an Inland ENC Content/Product Specification. In conjunction with what IHO decides for S-57 Edition 4 and its alignment with the ISO TC211 standards, there will be a separate register for specific Inland ENC features. Once IHO S-57 Edition 4 is released, it is expected that the Inland ENC Product Specification will become a separate application "profile" consisting of a feature catalogue, an application schema, and encoding.
Related Documents:	IHO S-57 Edition 3.1 → Edition 4
Related Projects:	nil

Background

Based on the findings of the European transport R&D project *INDRIS* (Inland Navigation Demonstrator for River Information Services) and the German project *ARGO* in 2001, both the Danube and the Rhine Commissions adopted an Inland ECDIS Standard for ENC data and system requirements for the Rhine and the Danube Rivers. In 2001 the Economic Commission for Europe of the United Nations (UN ECE) adopted the Inland ECDIS Standard as a recommendation for the European inland waterway system (CCNR 2002). To date, Inland ENC data conforming to the Inland ECDIS standard have been produced for the Rhine, Neckar, Main and Danube Rivers as well as for the Main-Danube-Canal in Germany, the Austrian portion of the Danube River, the Dutch connection between Rotterdam and the German border for the Scheldt River, the Garonne river in France, and sections of the Danube river in Slovakia, Hungary, Croatia, Serbia and Montenegro and Romania. Private companies are co-operating in producing complete Inland ENC coverage for remaining European navigable waterways. In addition, ECDIS and ECS equipment manufacturers that are active on the European inland waterways have upgraded their software to use Inland ENC data. At present, there are more than 2500 vessels in Europe that are using Inland ENC data.

In the USA following 1999 recommendation by the National Transportation Safety Board, the U.S. Army Corps of Engineers (USACE) initiated a program to facilitate the production and implementation of Inland ENCs on Major River and inland waterway systems in the USA. To date, 45 Inland ENC cells covering 3,200 miles on the Mississippi, Ohio, Red, and Atchafalaya Rivers, and the Black Warrior/Tombigbee system have been produced and are available for public access via the Internet (www.tec.army.mil/echarts/). In 2004, work began on five additional waterways. Similar to Europe, several North American ECDIS and ECS equipment manufacturers now offer systems capable of using Inland ENC data.

While there are some differences between the North American and European inland waterways, there are far more similarities. A North American – European Inland ENC Workshop was held in Nijmegen, The Netherlands on 30 June – 1 July 2003 in conjunction with a Conference on River Information Services (RIS) organized by the European R&D-project *COMPRIS* (Consortium Operational Management Platform River Information Services). In addition to informing participants on the status of standards development and projects being conducted, a key objective was to discuss the benefits of harmonizing Inland ENC data standards between Europe and North America.

Discussion

Harmonization Group
The North American – European Inland ENC Harmonization Group (IEHG) was formed in July 2003 and is comprised of representatives from government, industry and academia. The IEHG meets once per year, the most recent being an Ad Hoc IEHG meeting in St. Petersburg Beach, FL, USA in conjunction with the 2005 RTCM Conference (15-20 May 2005). However, most of the work is accomplished via e-mail correspondence and the *Open ECDIS Forum*. Key persons involved in the IEHG include:
 Co-Chairman
    Anthony R. Niles, U.S. Army Corps of Engineers (Anthony.R.Niles@erdc.usace.army.mil)
    Bernd Birklhuber, Ministry of Transport - Austria (Bernd.Birklhuber@bmvit.gv.at)
 Technical Coordinators
    Dr. Lee Alexander, University of New Hampshire (lee.alexander@unh.edu)
    Peter Kluytenaar, Serendipity, Unlimited. (peter@serendipity.nl)

Framework for International Inland ENC Specifications
The overall framework for the development of international Inland ENC standards includes several components.
    - IHO S-57 Edition 3.0/3.1 where applicable.
    - A central register for non-IHO S-57 object classes, attributes and attribute values.
    - A Base Content/Product Specification that includes all known Inland ENC requirements.
    - Regional product specifications containing items from local waterway networks not contained in the Base Inland Product Specification.
    - Use of the Open ECDIS Forum (www.openecdis.org) as a means for communication and publication.
    - Align with the future edition of IHO S-57 (Edition 4).

IHO S-57 3.1 and ENC Product Specification
IHO S-57 Edition 3.1, Appendix B.1 is the Product Specification for the production of "maritime" Electronic Navigational Charts (ENCs) to be used in conjunction with an IMO-compliant ECDIS. However, for Inland ECDIS some additional object classes, attributes and attribute values are required to meet real-world inland navigation requirements. The European Inland ECDIS Expert Group developed a regional product specification based on IHO S-57, Edition 3.0. The Central Commission adopted it in 2001 for Navigation on The Rhine (CCNR), Danube Commission (DC), the Economic Commission for Europe Of the United Nations (UN-ECE), and the Permanent International Association of Navigation Congresses (PIANC). In parallel, U.S. Army Corps of Engineers (USACE) also adopted in 2002 an Inland ENC Content Specification based closely on the IHO S-57 Edition 3.1 ENC Product Specification. The USACE Inland ENC (IENC) Content Specification has recently evolved to become an *IENC Chart No. 1 and Encoding Guide.*

Central Register
With the next edition of IHO S-57 (Edition 4), a central register is planned that will include both IHO and non-IHO extensions. The register will based on ISO TC211 standards, and is planned to be operational when S-57 Edition 4.0 is published (planned for 2006). In the interim, the *Open ECDIS Forum* (www.openecdis.org) currently serves as a central register for S-57 Edition 3.1 extensions.

Guidelines for Inland ENC specifications
    a) Existing and new S-57 objects:

- Wherever possible, use existing object classes, attributes and attribute values from the current IHO S-57 ENC Product Specification, Edition 2.0
- For additional object classes, attributes or attribute values that are not already described in the IHO S-57 Object Catalogue, first check the central registry for Inland ENC features.
- If the required object classes, attributes or attribute values are not described in the central registry, then new object classes, attributes or attribute values can be drafted and put forward to the IEHG for inclusion in the International Inland ENC set.

b) Creating new object classes, attributes or attribute values:
- An object class definition should be complete, covering all aspects of a real-world entity.
- An object class should represent an easily comprehendible concept. It is better to make two separate object classes if the definition of one object class is too lengthy and confusing.
- Each attribute should only exist once in an object class definition and should only contain one attribute value. The only exceptions to this rule are attributes of the type 'List'. These attributes should contain a composite string that can be broken down into a number of discrete values.
- The value of one attribute should not influence the value of other attributes, thus avoiding hierarchical dependencies within the attribute list of an object class.

c) Encoding rules
For all object classes, attributes, and attribute values, encoding rules should:
- Explain the basis for its creation.
- Describe its relationship to the real-world entity.
- Provide criteria for its proper use.
- Provide specific encoding examples for practical guidance.

Inland ENC Encoding Guide

In accordance with the decisions of the 2nd IEHG Meeting in St. Louis, MO, USA the European partners of IEHG proposed a common Encoding Guide for Inland ENCs based on the existing Encoding Guide of the USACE. The proposal covered all the additional objects and attributes of the European Inland ECDIS standard and the developments within COMPRIS. The USACE Encoding Guide and the comments from Russia have shown, however, that some additional objects and attributes of the current European Inland ECDIS Standard can be replaced by pure S-57 features. A proposal for the necessary changes in the European standard has been drawn up in the meantime on the basis of the Encoding Guide.

The European proposal for the Encoding Guide was reviewed in detail by the Core IEHG Team at the 2005 RTCM Conference (May 2005). A second draft version (Version 0.4, August 2005) will be finalized at the IEHG meeting in Rostock. The final draft will be presented to the European Commission at the final conference of COMPRIS (25th October, Rotterdam) and to the European Inland ECDIS Expert Group.

Another potential use of the Encoding Guide may be the near- and long-term development of a Register for Inland ENC objects and attributes. Since the Inland ENC Encoding Guide is based on a *MS ACCESS* Database, it may be possible to use this database as the backbone/framework for an Inland ENC Register. In particular, there are any number of tables and legends that can be generated and restructured as needed. It may also be possible to use the Inland ENC Encoding Guide for the development of an Inland ENC Application Profile that will be required to align with IHO S-57 Edition 4.

Alignment with IHO S-57 Edition 4

It is the intention of the Inland ENC Harmonization Group to conform to what is being planned for IHO S-57 Edition 4. In doing so, there will be several benefits:

a) All real-world Inland ENC-related object classes, attributes, and attributes values can be included with S-57 Edition 4. The current Object Catalogue will become a series of *Feature Data Dictionarie*s.

b) In order to align with the ISO TC/21 standards, an overall IHO "*registry*" will be established that contains individual "*registers*." In addition to a hydrographic register, there will be registers for Ice Information, Additional Military Objects (AMLs) and for Inland Charting applications. For each register, there will some entity or organization responsible for its content and management. For Inland ENC applications, this initially will be performed by the IEHG. In the future, this activity could be taken over by some other organization (e.g., PIANC).

c) An *application schema* will specify how:
- features, attributes and associations are used to specify a data model
- the various components are 'glued' together (i.e. a feature and its spatial component)

- to use a register as part of an overall registry

These rules can then be applied to develop a product-specific application schema (e.g., Inland ENC) that in turn forms the basis of the product specification.

d) The *Inland ENC Base Product Specification* will become a separate "profile" consisting of a feature catalogue, an application schema, and encoding.

Assuming that it is clear what needs to be done to comply with IHO S-57 Edition 4, it is intended that Inland ENC specifications will conform.

Recommendations

The ECDIS Stakeholders Workshop during the CHRIS 17 meeting provides an occasion for the IEHG to present Inland ENC development to IHO and to key players of maritime ECDIS.

Impact

In conjunction with what IHO decides for S-57 Edition 4 and its alignment with the ISO TC211 standards, there will be a separate register for specific Inland ENC features. Once IHO S-57 Edition 4 is released, it is planned that the Inland ENC Base Product Specification will become a separate application "profile" consisting of a feature catalogue, an application schema, and encoding.

Action Required of CHRIS

CHRIS is invited to note the activities related to Inland ENC Development.

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