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INLAND ECDIS DEVELOPMENT AND STANDARDIZATION

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Executive summary:	Report on the work undertaken and progress made since CHRIS15 on developing and standardizing Inland ECDIS through North American and European collaboration, and future plans.
Actions to be taken:	CHRIS to note the report, and endorse the future plans.
Related documents:	CHRIS letter No. 2/2004 (call for reports)
Related Projects:	Not applicable

Introduction

Based on the findings of the European transport research and development 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 electronic chart data and system requirements for the Rhine and the Danube Rivers. In 2002 the Economic Commission for Europe of the United Nations (UNECE) adopted the Inland ECDIS Standard as a recommendation for the European inland waterway system. To date, Inland ENC data conforming to the Inland ECDIS standard have been produced for the Rhine, Main and Danube Rivers 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.

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.

Although there are some differences between the North American and European inland waterways, there are many more similarities. As such, during 30 June and 1 July 2003, a North American – European Inland ENC Workshop was held in Nijmegen, The Netherlands. This Workshop was organized in

conjunction with a **COMPRIS** (Consortium Operational Management Platform River Information Services) Conference on River Information Systems (RIS). In addition to informing participants on the status of standards development and projects being conducted, an important objective was to explore the opportunity to harmonize standards with the goal of achieving an international Inland ENC standard. By the end of the Workshop, the participants unanimously agreed on an approach towards harmonization of Inland ENC data standards between Europe and North America.

Framework for International Inland ENC Specifications
The framework comprises the following elements:
- IHO S-57 Edition 3.1 ENC Product Specification where applicable.
- A central registry for IHO/non-IHO S-57 object classes, attributes and attribute values.
- A core product specification suitable for all known Inland ENC specifications
- An unlimited number of regional product specifications applicable for local/regional waterways and rivers throughout the world.
- Use of the *Open ECDIS Forum* (www.openecdis.org) as a means for communication and publication.

IHO S-57
        IHO S-57 Edition 3.1 contains a Product Specification for the production of "maritime" Electronic Navigational Charts (ENCs) to be used in conjunction with an IMO-compliant ECDIS. With the advent of Inland ECDIS it became evident that additional object classes, attributes and attribute values were required to meet real-world inland navigation applications. The European Inland ECDIS Expert Group developed a regional product specification based on IHO S-57, Edition 3.1. The Central Commission adopted it in 2002 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.*

Core Product Specification (CPS)
        At the Nijmegen Workshop, it was agreed to develop an Inland ENC Core Product Specification that would be suitable for all known inland ENC requirements. The Core Product Specification will be comprised of current IHO S-57 Ed. 3.1 object classes, attributes and attribute values that are applicable to inland navigation, plus a generic set of classes, attributes and values that are required for both North America and Europe. Furthermore, the CPS will contain a set of generic encoding rules that can be used to make inland ENCs of both North American and European water networks. Target date for completion is December 2004. It is hoped that the Core Product Specification will be suitable for all regions of the world. To date, South America[1] and China[2] have expressed an interest.

Central Registry
        In conjunction with the next version of IHO S-57, a central registry is planned that will include both IHO and non-IHO extensions. The registry will based on ISO TC211 standards, and is planned to be operational when S-57 Version 4.0 is published (planned for 2006). In the interim, the *Open ECDIS Forum* (http://www.openecdis.org/) currently serves as a central registry for S-57 Edition 3.1 extensions. The Nijmegen Workshop it was agreed to use the OEF registry as an interim solution so as not to delay the work on Inland ENC specifications and data production. Future extensions to the CPS and regional product specifications also will be registered with OEF.

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[1]   Presently there are private initiatives to use ECDIS on major South American rivers.
[2]   China and Hong Kong have expressed interest in the developments of Inland ECDIS.

Regional Product Specifications

S-57 object classes, attributes, attribute values and encoding rules that are specific to a regional river system or inland waterway network will described in the form of a regional product specification (RPS). However, a complete product specification for Inland ENC production will be comprised of both the Core Product Specification (CPS) and a Regional Product Specification. All parties interested in the framework of the Core Product Specification are invited to produce their own, specific RPS. Elements of an RPS that can be identified as common to a majority of RPSs could become candidates for inclusion in to the CPS.

Guidelines

During the Nijmegen Workshop a set of general guidelines were agreed:

Guidelines for developing regional product specifications:

• When possible, use existing generic set of object classes, attributes and attribute values.
• If new object classes, attributes or attribute values are required, first check the central registry.
• If the required object classes, attributes or attribute values are not described in the generic set or central registry, then a new object class, attributes or attribute values can be created.

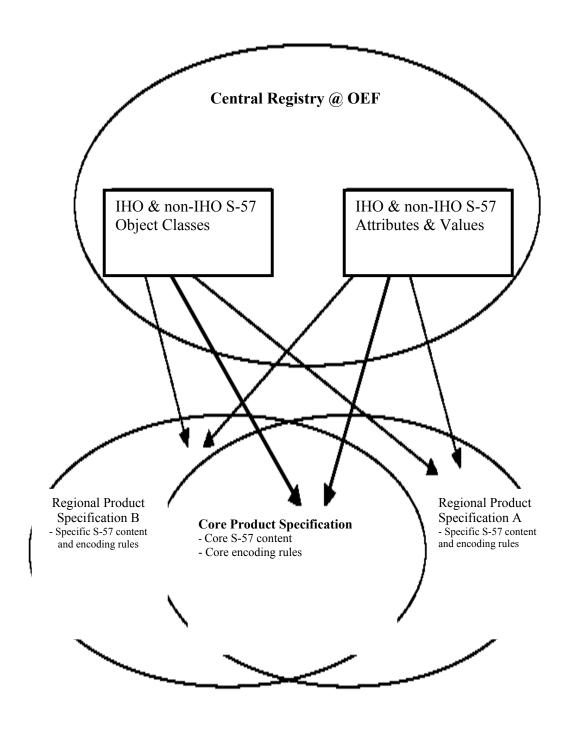Guidelines for creating new object classes, attributes or attribute values:

• 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.
• 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.

Guidelines for creating encoding rules for a regional product specification

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.

Figure 1 – Conceptual Approach for Developing "International" Inland ENC Specifications

Central Registry @ OEF

IHO & non-IHO S-57
Object Classes

IHO & non-IHO S-57
Attributes & Values

Regional Product
Specification B
- Specific S-57 content
  and encoding rules

Core Product Specification
- Core S-57 content
- Core encoding rules

Regional Product
Specification A
- Specific S-57 content
and encoding rules

Harmonization Group.

At the completion of the Nijmegen Workshop, it was agreed to consolidate the two groups from Europe – North America into one Working Group. Comprised of representatives from government, industry and academia, the name of the working group is the **Inland ENC Harmonization Group** (IEHG). It is planned that this working group will meet at least once per year. The next meeting is planned for 22-24 September 2004 in St. Louis, Missouri, USA. However, most of the work is accomplished via e-mail correspondence and the *Open ECDIS Forum*.

Four key persons involved in the IEHG include:
        Co-Chairman
                Bernd Birklhuber, Ministry of Transport - Austria (Bernd.Birklhuber@bmvit.gv.at)
                Anthony Niles, U.S. Army Corps of Engineers (Anthony.R.Niles@erdc.usace.army.mil)
        Technical Coordinators
                Dr. Lee Alexander, University of New Hampshire (lee.alexander@unh.edu)
                Peter Kluytenaar, Serendipity, Unlimited. (peter@serendipity.nl)

Way Forward

Inland ENC Harmonization Group established a goal to agree upon on a Core Product Specification (CPS) for Inland ENC by 30 September 2004. It is intended to meet all ENC data requirements necessary for inland navigation in European and North American waterways. The CPS will be comprised of IHO S-57 object classes, attributes and attribute values, and will include a set of generic encoding rules (i.e., a coding guide) to ensure data uniformity and consistency. Ideally, this Core Product Specification will be suitable for worldwide use.

Associated with this primary goal are other related objectives:

1. Establish a central registry for new/modified IHO S-57 object classes, attributes and attribute values applicable to Inland ENC that are not currently contained in IHO S-57 Edition 3.1 Object Catalogue. This will be accomplished using the *Open ECDIS Forum* (OEF).

2. Develop Regional Inland ENC Product Specifications for Europe and North America that supplement the Core Product Specification. Included in this effort will be guidelines for:

    a) Developing Regional Product Specifications
    b) Creating new object classes, attributes and attribute values
    c) Establishing encoding rules (i.e., a coding guide)

3. Use the *Open ECDIS Forum* a means for communication and publication within the IENC Harmonization Group, and with other interested parties.

Based on what was discussed at the 6th Meeting of the TSMAD S-57 Ed. 4 Sub-WG (29 March – 2 April 2004, Silver Spring, MD, USA), it is hoped that Inland ENC will be included with a new Work Item 2.10 (Non-IHO Applications). In conformance with the anticipated ISO TC211 standards approach that S-57 Edition 4 will follow, it is also hoped that:
    a) Additional Inland ENC-related object classes, attributes, and attributes values can be included with S-57 Edition 4 (i.e., the current S-57 Edition 3 Object Catalogue will become a S-57 Edition 4 Feature Data Dictionary)
    b) The Inland ENC Core Product Specification will become a separate "profile" (i.e., formerly called a product specification) with the publication of S-57 Edition 4.

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