Production of Marine Information Overlays (MIOs)

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Relationship to Current/Future IHO Standards

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Marine Information Overlays (MIOs)

- Chart and navigation-related information that **supplement** the minimum information required by IMO ECDIS
  - Additional, non-mandatory
  - Not covered by existing standards (e.g., IHO S-57, IHO S-52, or IEC 61174)
  - The “everything else”
  - Points, lines, areas, feature objects
Relationship of chart and operational to Navigation-related information

[Source: IEC Report to IMO NAV48]
Foundation Data Layers for Marine GIS

- Shoreline
- Bathymetry
- Cadastral (boundary)
- Environmental Sensitivity Index
- Habitat and species location
- Benthic mapping (seagrass, corals, ...)
- Ports and vessel traffic
- Geo-regulations
COLLECTION AND USE OF HYDROGRAPHIC DATA

IHO Paper Chart
Standard M-4

IHO Transfer Standard S-57

Digital Hydrographic Database

CD ROM
Electronic Navigational Chart

Paper Navigational Chart

Digital Hydrographic Survey
IHO Standard S-44

Other GIS Applications

Monitoring Human Activities and Development

Coastal Zone Management

Long Term Management (Erosion, Pollution, Water Levels etc)

Environmental Management

Disaster Management (Accidental Pollution)

Biological Physical

Resource Management

Bathymetric Mapping
S-57 ENC Product Specification

- Used by HOs to produce ENC data for ECDIS
- Current version (3.1) recently updated (3.1.1) to meet new IMO requirements:
  - Particularly Sensitive Sea Area (PSSA)
  - Archipelagic Sea Lanes (ASL)
- Since MIOS are used with ENCs, they should conform – as much as possible – to the ENC Product Specification.
General Content Specification

**Purpose:** Produce all MIOs in conformance with a single, overall data content specification.

- Based on ENC Product Specification
- Is similar to Additional Military Layers (AMLs) specification developed/used by NATO.
- ENC software manufacturers will not have to develop new software tools to deal with MIOs.*
- Existing ECDIS/ECS can read MIOs in the same manner as ENCs and AMLs. **

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* CARIS, ESRI, Jeppesen Marine/C-Map, & SevenCs
** Transas Marine & ICAN
5.6.3 Data set files

MIO data set files follow the same basic approach that is used for ENC and AML (8 characters). More specifically, they are named according to the following convention:

<table>
<thead>
<tr>
<th># characters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Producer Code (from IHO S-62[1] or OEF Producer Code Register[2])</td>
</tr>
<tr>
<td>2</td>
<td>MIO category (M + MIO sub-category as a capital letter)*</td>
</tr>
<tr>
<td>1</td>
<td>Scale band (most will be non-scale = zero)</td>
</tr>
<tr>
<td>3</td>
<td>Unique MIO number (a producer organization develops its own scheme)</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

* MIO sub-categories include:

- A  Aids-to-navigation (AtoN)
- C  Current flow
- D  sailing Directions
- L  Logistics
- M  Marine environmental protection
  - coral reef
  - Marine Protected Area (MPA)
- O  Oceanographic
- P  Pipelines/cables
- S  Security
- T  Tide/water level
- V  Viewpoint (as exists in AMLs)
- W  Weather/meteorological

Note: This same order and designation will be used in the MIO Encoding Guide.

MIO Encoding Guide

Purpose: Provides detailed guidance on how specific types of MIOs are encoded.

Using existing/new S-57 object classes, attributes, and attribute values:

1. Provides basis for creation
2. Describes relationship to real-world entity
3. Provides criteria for its proper use
4. Gives specific encoding examples
Approach will be similar to what is being used to encode Inland ENC data for rivers and inland waterways.

<table>
<thead>
<tr>
<th>O - Buoys, Beacons and Daymarks, Notice Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O.1 Buoys</strong></td>
</tr>
<tr>
<td><strong>O.1.1 Lateral Buoy (O)</strong></td>
</tr>
</tbody>
</table>

- **Real World (Can)**

- **Real World (Nun)**

- **Real World (EU)**

<table>
<thead>
<tr>
<th>Graphics</th>
<th>Encoding Instructions</th>
<th>Object Encoding</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) EU: The designator as it appears on the buoy, if it can be read from a passing vessel, should be encoded in the attribute OBJNAM. Administrative information on the buoys that is not relevant for navigation should be encoded in the attribute NOBJNM. It is not repeated for each slave object.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B) US: Buoys used on the inland system are not uniquely named or identified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C) EU: In case TOPMAR is added: TOPSHP = 5 (cylinder, can) for right hand side buoys TOPSHP = 1 (cone, up) for left hand side buoys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D) EU: BOYSHP/catiam/COLOUR attributes must be used in the following combinations: 1 (nun) / left-hand / green 2 (can) / right-hand / red or green spar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E) US: BOYSHP/catiam/COLOUR attributes must be used in the following combinations: 1 (nun) / starboard-hand lateral mark / red 2 (can) / port-hand lateral mark / red</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Object Encoding**

- **Object Class** = boylat(F)
- (M) BOYSHP = [1 (nun), 2 (can), 3 (spherical), 4 (pillar), 5 (spar), 8 (ice buoy)]
- (M) catiam = [1 (port-hand lateral mark), 2 (starboard-hand lateral mark, 5 (right side), 6 (left side), 7 (right fairway side), 8 (left fairway side), 11 (fairway at the right side), 12 (fairway at the left side), 13 (fairway change to the right side), 14 (fairway change to the left side)]
- (M) COLOUR = [1 (white), 3 (red), 4 (green), 5 (yellow)]
- (C) marsys = [1 (IALA A), 2 (IALA B), 11 (CEVNI), 12 (Russian Inland Waterway regulations)]
- (O) CONRAD = [3 (radar conspicuous) (has radar reflector)]
- (C) OBJNAM = (designator as it appears on the buoy)
- (C) NOBJNM = (same content as OBJNAM in national language or administrative information)
- (C) INFORM = (US: see F, EU: see G)
- (M) SCAMIN = [EU: 22000, US: 60000]
- (C) SORDAT = [YYYYMMDD]
- (C) SORIND = (Refer to Section B)
“Virtual AtoN”

**Lower** river stage
&/or
less powerline sag

**Higher** river stage
&/or
more powerline sag

Source: Ralph Scheid, USACE New Orleans District
Current Vectors* on Inland ENC

* A River Information Overlay (RIO)
IMO Performance Standards for ECDIS:

1. Chart-related
   “IHO recommended colours and symbols (IHO S-52) should be used to display SENC information”

2. Navigation-related
   “other navigational information may be added to the ECDIS display. However it should not degrade ...and be clearly distinguishable from SENC information.”

   “the colours and symbols used to describe navigational elements and parameters ...are published in IEC 61174”
International MIO Development

IHO-IEC Harmonization Group on Marine Information Objects (HGMIMO)

- meets once year; last meeting (May 2007) at Univ. of NH
  - Anyone can participate.

Recommended Procedures for Development of MIOs (endorsed Dec 2004)

- How a competent organization identifies MIO requirements
- Information content for MIO category
- Development of new S-57 objects & attributes
- Colours and symbols (based on IHO S-52); portrayal
- Test and evaluation
- Production and dissemination
- Regulatory requirements for use (if needed)
Overall Framework

- S-57 3.1/3.1.1 where applicable
- Use existing S-57 Object Catalogue
- MIO Register for new S-57 objects & attributes
- “General” MIO Content Specification
  - Specific MIO Product Specs
- MIO Encoding Guide
- Use Open ECDIS Forum (www.openecdis) for communication and publication
- Align with future IHO S-100
IHO Information Registry
(for S-57 and S-100)

FDD Registry

- Hydro
- IENC
- NPub
- [MIO]
- Ice
  - [Weather]
  - [Tides/WL]
  - [Current Flow]
  - [MEP]
  - [RIOs]
- [Others TBD]

Portrayal Registry

- S-52
- IENC
- NPub
- [MIO]
  - [Ice]
  - [Weather]
  - [Tides/WL]
  - [Current Flow]
  - [MEP]
  - [RIOs]
- [Others TBD]

Metadata Registry

Agreed to at CHRIS 19
MIO References Documents

HGMIO Terms of Reference
General Content Specification
Relationship of MIOs to Current/Future IHO Standards
Recommended Procedures for Development

All posted at: www.iho.org/committees/hgmio
Summary

- MIOs are supplemental geo-spatial information that are used with an ENC.
  - ENCs for safety-of-navigation
  - MIOs for additional information (marine environmental protection, coastal zone management, etc.)

- ENCs + MIOs = broader range of uses for IHO S-57/S-100 data.

- HGMIO welcomes the participation of all interested parties.
  - HOs, environmental protection agencies/organizations, academic, industry, mariners, etc.