

Paper for Consideration by S-100WG4
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IHO Level Guidance on how to manage the IHO Maritime Resource Names (MRN) namespace

Submitted by:	S100WG Chair
Executive Summary:	Draft guidance for managing the IHO Maritime Resource Names (MRN) namespace. (This is an update of a paper presented at S-100 WG TSM6.)
Related Documents:	S-100, TSM5-4.5
Related Projects:	GI registry

Introduction / Background

The MRN concept is a powerful mechanism for generating globally unique identifiers. Its flexibility is a major factor for its adoption by several organizations involved in e-Navigation, see <http://www.iala-aim.org/technical/data-modelling/mrn/> for more details. With this flexibility comes the need to create robust rules governing the use, else disharmony between users is a risk that can reduce the usefulness of the concept. A high-level concept introduction and use guidance for MRN can be found on the MRN Registry site at the following link:
<http://mrnregistry.org/Maritime%20Resource%20Name.docx>.

The guidance given in this document only considers how IHO should govern its namespace (urn:mrn:iho). Guidance is also given for how IHO should use the MRN identifier concept when creating Globally Unique Identifiers (GUID). IHO has several outputs that can benefit from utilizing MRN identifiers such as IHO publications and standard, IHO data products. Moreover, the MRN concept may benefit data products generated in compliance with IHO standards, and object instances used in data products generated in compliance with IHO standards, therefore this document also includes guidance for producers of IHO standards-based data.

It is recommended that a governing body takes the responsibility for the management of the IHO MRN domain. It is envisioned that the management can be done in a similar way as S-62, with the IHO Secretariat managing the domain on behalf of IHO. As part of managing the IHO MRN domain, IHO should set up a public location for publishing the designated MRN namespaces to permit easy discovery of intended use of the namespace and who owns or administer it.

This guidance considers three distinct structures for IHO Publications, IHO data products and object instances in products created in accordance with IHO Standards. Other uses are briefly discussed in the clause on FUTURE considerations.

Rules that apply to all MRN namespaces

The urn:mrn namespace is fixed and is administered by IALA. Anyone wishing to utilize the concept, must apply for a namespace Organizational ID (OID). Any sub namespace after the OID is administered

by the owner of the OID. The Namespace Specific String (NSS) of all URNs that use the "mrn" NID shall have the following structure:

```
<URN> ::= "urn:mrn:" <OID> ":" <OSS>  
<OID> ::= 1*(ALPHA / DIGIT) ; Organizational ID; iho  
<OSS> ::= <OSNID> ":" <OSNS> ; Organizational specific string  
<OSNID> ::= 1*(ALPHA / DIGIT / "-") ; Organizational specific namespace ID  
<OSNS> ::= 1*<URN chars> ; Organizational specific namespace string
```

Character set used

```
DIGIT ::= %x30-39 ; 0-9  
ALPHA ::= %x61-7A ; a-z
```

The entire URN is case-insensitive

References

IALA ENAV17-9.14 Maritime Resource Name.

(<http://mrnregistry.org/Maritime%20Resource%20Name.docx>)

TSMAD26/DIPWG5_11.7E Uniform Resource Identifiers for S-100.

(https://www.iho.int/mtg_docs/com_wg/TSMAD/TSMAD26/TSMAD26_DIPWG5_11.7E_S-100-URIs.pdf)

S-100WG TSM5-4.5 Maritime Resource Names (MRN) concept.

(https://www.iho.int/mtg_docs/com_wg/S-100WG/TSG5/TSM5-4.5_MRN_Proposal.pdf)

Rules for IHO level use of MRN

The successful management of the IHO MRN requires some overarching rules and management of these rules. Below is a set of proposed rules for the management of the IHO MRN namespace. IHO should set up a governing body that is tasked with the responsibility of management of the IHO MRN namespace. It is envisioned that the management can be done in a similar way as S-62, with the IHO Secretariat managing the namespace on behalf of IHO. As part of managing the IHO MRN domain, IHO should set up a public location for publishing the assigned MRN namespaces to permit easy discovery of intended use of the namespaces and who owns or administer it.

Registry of reserved codes

To avoid redundancies and improper use of elements that make up an MRN, it is recommended to establish ranges of reserved codes, such as producer codes, and other codes as appropriate for use during development of specifications. For example, "JS00" should be a reserved producer code for "Jussland" test datasets. Similarly, "S000" should be reserved as a wildcard where it is unknown or impractical to assign a product specification to a feature instance.

Maximum length of an MRN

In the MRN specification there is no given limit to the length of an MRN. However, the length of an MRN adds to the byte size of a dataset, and longer MRNs add more than shorter ones. The urn:mrn:iho part is 11 bytes, and additional characters will add one byte per character, per instance. Some flexibility may be useful in the length to give sufficient space for different cataloging purposes. It is recommended that the maximum total length of any MRN should be no more than 128 bytes.

Preservation of MRN

It is recommended that, as far as possible, MRN GUIDs be preserved throughout a functional object's lifetime. This should be done also when that functional object is reused in products other than where it originated. The term functional object is used to account for an object possibly having different identifiers depending on the use or interest of a user. For example, a lateral buoy at a particular place in a channel may be assigned an identifier for the location, while the buoy equipment may change with seasons, such as winter buoys. The buoy equipment itself may also have identifiers, but for navigation use the equipment identifier may not be interesting, while the functional object identifier will certainly be interesting. Preservation of the MRN GUID supports the traceability of an object to its source and also enables user systems to link instances of the same object across products, maintaining the integrity of data interpretation.

The question of whether one data object is the same as or different from another is quite complex. Different data products or different versions of the same product may add or remove attributes, coordinates may be different at different scales, the number of points in a curve, surface boundary, multipoint, or grid may be different at different scales, the nature of spatial primitive may change as scale increases or decreases (area geometry becoming point geometry at a smaller scale), or feature geometries may be merged at some scale (e.g., an islet merging with a nearby land area). Due to these different factors, a firm set of universal rules is difficult to establish. The product specification authors (or in the last resort, the data producer) should therefore establish rules as appropriate for their data product (or production process) considering the various aspects that may impact data production. An overarching goal should be to improve overall consistency, where needed, over time.

IHO Publications

It is recommended that IHO assign MRN identifiers for IHO Publications. It is recommended to have a distinct sub namespace for publications, followed by a few distinguishing characteristics for the individual publication to make the MRN ID globally unique.

Consider this format of the MRN for publications:

urn:mrn:iho:pub:<publication type>:<publication name or number>:<edition number>:<correction number>:<clarification number>:<optional and additional version information>.

This makes 'pub' a designated namespace for publications, and means that any parts of the identifier that comes after indicate the type and name of the IHO publication. The optional section and additional version information may be used for additional namespaces as needed, or omitted.

IHO's current publication types and proposed codes for these are:

- Bathymetric Publications - bathy;
- Capacity Building Publications - cb;
- Miscellaneous (Base Regulatory Publications) - reg;
- Periodic Publications - per;
- Standards and Specifications - spec.

Example:

The standard S-57 edition 3.1 with supplement 3 would be given the following MRN identifier:

```
urn:mrn:iho:pub:spec:s57:3:1:supplement3
```

Note that S-57 uses a different version numbering system that is different from S-100.

IHO data products

For IHO data products it is recommended to have a namespace for products.

Consider this format of the MRN:

```
urn:mrn:iho:prod:<product name>:<edition number>:<correction number>:<clarification number>:<optional and additional information about related specification>
```

This makes 'prod' a fixed namespace for products, and means that any part of the identifier that comes after, indicate the type and name of the IHO product. The optional section and additional version information may be used for additional namespaces as needed, or omitted.

Examples:

For S-64 ENC test dataset version 3.0.1, unencrypted, used for the power up check the ID could be:

```
urn:mrn:iho:prod:s64tds:3:0:1:unencrypted:powerup
```

For IHO INT3 version 3.5, Lowesmouth to Port Rimon panel, scale 1:19000, the ID could be:

```
urn:mrn:iho:prod:int3:3:5:19000
```

The MRN for the product specification should be included in the specification. S100WG should define a specific section within the product specification template to ensure the MRN for the product is included in the product specification.

Object instances in data products

For harmonization purposes a common structure should be considered for MRN identifiers for object instances. This enables a predicable upper level MRN GUID namespace (which can be leveraged for reducing total data volume) that can be defined for each IHO product specification. Moreover, the producers of data are given flexibility over how they wish to manage their namespaces; also, it includes a clear delineation between the fixed upper level (urn:mrn:iho) and flexible (developer defined) lower level of the MRN identifier.

IHO product specifications are recommended to follow this format of the MRN for object instances.

urn:mrn:iho:<product specification>:<producer code>:<producer governed namespaces>.

Note: the section marked producer governed namespaces may be further subdivided into additional name spaces as per producer need. The object id should be included in this section.

The namespace for product specification is used to link the feature instance to the data model/product where the instance was first created. This information improves traceability and is particularly useful when making decisions about MRN preservation, since the original data model gives an indication of any attribute changes between data products, which in turn can impact decisions for keeping or changing the MRN.

For example; a Marine Protected Area originating on an S-122 dataset with an MRN of urn:mrn:iho:s122:us01:hi:0987654321, should retain this MRN when reused in an S-101 datasets, even if some of the attributes are dropped for the S-101 use.

It is important to note that some data formats that use URI namespaces (GML, XML, RDF, OWL) may give specific meaning to parts of the MRN ID, such as GML where the colon has special significance¹. MRNs should therefore not be used verbatim for GML identifiers (“gml:id”) or tags. Instead, for GML, MRNs should be used as values for an *identifier* attribute. Product specifications that use another encoding with limitations similar to GML must define sufficient guidance to link MRN IDs to objects.

A structure like urn:mrn:iho:<product specification>:<producer code>:<producer governed namespaces> (urn:mrn:iho:s000:CCYY: - 000 is the product specification number, CCYY is the S-62 code pending change as per S-100WG3-6.4) gives predictability to the fixed part of the MRN GUID, permitting byte saving schemes, such as having the fixed part stated in metadata such as by using a defined alias. If the byte saving scheme is implemented in a product specification, a function for re-creating MRN GUIDs would be needed in user and production software to permit systems to identify objects (e.g., feature instances) across products. Also needed are rules for how to preserve MRN GUIDs of objects that originate elsewhere, for example checks can see that if an MRN GUID starts with MRN the origin is elsewhere², and in all other cases the MRN GUID should begin with the <producer code>. The same rules can also be configured with a list of permitted MRN name spaces to ensure that only permitted inputs are used and help identify erroneous MRNs. It is also recommended to create rules for the preservation of MRN GUIDs of objects that originate elsewhere. These rules would ensure that <producer code> portion of the MRN GUID is consistent throughout the file.

Preservation of MRN GUID between products

The overarching rule should be that objects that are generally considered scale independent, and preserved in the same location and with the same shape through scales and products should retain the same MRN ID in those products. Scaled objects need not be considered as the same object between scales.

¹ The URN format cannot be used for values of the built-in XML Schema type ID, and “:” in an XML tag is reserved for separating namespaces from “local names”.

² Checks can be designed to look for permitted sources and flag all cases that do not meet the condition.

When deciding if the MRN of an object should be preserved, product specification authors³ should specify how a producer should determine the similarity of the instance to the original. Classes whose attributes are subsets of the original object class attributes should be considered the same and their instances should have the MRN preserved. When adding attributes, consideration should be given to the intent of the object, and as long as it is to describe the same physical phenomenon and the instance uses the original feature as a starting point, the ID should be preserved.

Assignment of MRN to objects

It remains to be determined how exactly to define an individual object that would be assigned an MRN.

Often, what appears to be "the same object" on the surface could be quite a different story under the hood. Is an object deserving of an MRN simply the static geometry associated with that object regardless of other attributes that may or may not accompany it in different data products or versions of the same product? Or if the geometry changes or merges for any reason (for example, due to different scales: coordinate or spatial primitive changes, number of points in the geometries/grids, area becoming point, etc.) is it then appropriate to assign a new MRN to each of those permutations?

Further discussion is needed to determine the procedure of assigning MRNs to these types of objects keeping in mind maintenance, uniqueness, and use of the MRN purpose for each object.

Producer level guidance

This section is for guidance over the management of the sub-level namespace, such as for countries or producer organizations that generate data in compliance with IHO product specifications.

It is recommended that all namespace owners develop a guideline for managing their name spaces. Consider the following paragraphs as a draft guideline that provides the starting point for implemented guidelines.

When creating source data, data producers may find it challenging to know beforehand which data model a new object will be utilized in, for example when using source databases that store objects once and utilize them multiple times. Similarly, it may be that a source object will be used in two or more products, using different specifications. In such cases it is recommended that the data producer assigns a code in the product specification namespace using one of the following methods:

- Assign the code of the first product the object is used in.
- Assign the code of the lowest possible number product the object is used in. (Note that if the source object is used in a lower-numbered product later, the code does not change, because object MRNs should be stable.)
- Use the wildcard of "S000". (Note that if the wildcard is used, it may become more difficult to assess the object for MRN preservation purposes.)

³ Leaving this decision completely to data producers may lead to multifarious criteria for the same data product. There should be some guidelines for data producers to follow. The best people to determine those guidelines are the product specification teams and the best place for the guidelines is the individual product specification.

The recommended maximum total length should be no more than 128 bytes, meaning 22 bytes are set aside for the upper level name spaces (urn:mrn:iho:s000:CCYY:), leaving up to 106 bytes for producer governed namespaces. In an effort to reduce file sizes of products, the length of MRNs should be kept to a minimum.

It may be advantageous for some producers to subdivide MRN IDs. Reasons can be that more than one office produce data in a particular domain inside one country or several contractors are granted work in producing products. For example, IDs can be subdivided at a national level by provinces, by projects or by topics where a specification contains several topics, such as ENC. It is up to the producer to specify how such sub division is done.

The data production process should include functions to preserve MRN IDs of scale independent features from original source to all derived products. The process should consider the intent of objects, if the purpose is to describe the same physical phenomenon, and the instance use the original feature as a starting point, the ID should be preserved. It is not necessary to preserve the MRN of scale dependent features.

Examples of how a MRN GUID from another domain may look among other product producer generated MRN IDs;

Feature: Recommended Track

Attribute: category of recommended track: Based on a system of fixed marks

Attribute: orientation: 270 degrees

Attribute: MRN: urn:mrn:iho:s101:jsho:12345678

Feature: Navigational Line

Attribute: category of navigation line: leading line bearing a recommended track

Attribute: orientation: 270 degrees

Attribute: MRN: urn:mrn:iho:s101:jsho:87654321

Feature: Landmark

Attribute: category of landmark: tower

Attribute: function: light support

Attribute: MRN: urn:mrn:iala:s201:jscg:54321678

Feature: Light

Attribute: category of light: leading light

Attribute: colour: white

Attribute: MRN: urn:mrn:iala:s201:jscg:45678123

Feature: Range System

Attribute: name: Micklefirth approach range

Attribute MRN: urn:mrn:iho:s101:jsho:23456781

Aggregation: Range System Aggregation

Consists of: MRN: urn:mrn:iho:s101:jsho:12345678

Consists of: MRN: urn:mrn:iho:s101:jsho:87654321

Consists of: MRN: urn:mrn:iala:s201:jscg:54321678

Consists of: MRN: urn:mrn:iala:s201:jscg:45678123

Future considerations

Although the MRN concept is incredibly powerful and flexible, some management challenges remain to be addressed. An example is the GI Registry which has the camelCase ID as a GUID for feature concepts but also different domains. The GI Registry uses camelCase notation for GUIDs assigned to feature concepts and domains. This GUID structure creates uncertainty of how an MRN structure could be defined, since it ideally should be a common harmonized structure for the GI registry as a whole. Specifically, it is unclear if all submitters should be subject to the IHO namespace, or should they be permitted to use their own name spaces. Either way could be done, but would first require a name space from the MRN registry or an MRN namespace from IHO for any submitting organization. Another question that will have to be answered is how to structure MRN for different domains, similar questions remain here as with the submitting organizations. It is therefore recommended that using MRN for the feature concepts in the GI Registry is delayed till a later time when more consideration can be given to the issue.

MRN format should take into consideration whether mapping of an MRN to a URL may be needed in the future, for example to facilitate lookup of additional information, metadata, or updates to a data object. See S-100 11-7.4 and TSMAD26/DIPWG5_11.7E for more information and hypothetical use cases.

Consider linking with S-62, e.g. no organization get an OSNID unless they already have an S-62 ID. This enables a link between S-62 and producers of data. It is recommended that there is no automated creation of S-62-linked OSNID in order to clean up the content of S-62. Linking to S-62 codes permit organizational name change without needing a code change.