

# GUIDELINE

**G1143**

## UNIQUE IDENTIFIERS FOR MARITIME RESOURCES

**Edition 2.0**

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# DOCUMENT HISTORY

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Revisions to this IALA document are to be noted in the table prior to the issue of a revised document.

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## 1. INTRODUCTION

The use of unique identifiers is a necessary development of e-Navigation to maintain harmonization across domains and services. Navigationally unique objects such as Marine Aids to Navigation (AtoN), and Vessel Traffic Service (VTS) products and services and other maritime services require identification numbers to avoid duplication and misalignment of AtoN and Maritime Safety Information (MSI).

Worldwide harmonized identification of unique identifiers for maritime resources can:

- assist in the development and maintenance of enhanced data exchange applications for ship to ship, ship to shore, shore to ship and shore to shore in the context of e-Navigation;
- assist administrations in the efficient delivery of MSI; and
- reduce the administrative burden associated with the maintenance of international list of lights numbers and other navigation products.

This is not unique to the maritime domain, and this Guideline describes a syntax for Maritime Resource Names (MRN) based on proven methods from the internet domain, that will enable IALA members to issue unique identifiers for objects such as AtoN, VTS products and services, waterways, etc. in a format that is designed to be compatible with existing lists of lights, yet interoperable with usage in different domains such as Electronic Navigation Charts (ENC).

The MRN namespace defined by this Guideline can be applied in numerous areas within the maritime domain, and other maritime stakeholders are invited to adopt this syntax for creation of unique identifiers.

### 1.1. RELATED DOCUMENTS

ISO 3166-1 – The International Standard for country codes and codes for their subdivisions

RFC 2141 – URN Syntax (<https://www.ietf.org/rfc/rfc2141.txt>)

IHO S-100 version 4.0.0 – Universal Hydrographic Data model

## 2. BACKGROUND

The International Hydrographic Organization (IHO) has noted in paper HSSC6-5.4B the problems Hydrographic Offices (HOs) may be confronted with if the existing light numbering schema is subject to changes by either the producing HO national light numbers or the UKHO international light number.

HSSC6-5.4B discussed the advantages of a Persistent Unique Identifier (PUI)<sup>1</sup> for lights and its possible consequences. The support of the IMO e-Navigation solution S3 was highlighted. In addition, the possible effects on the workload for HO's which are deriving their products from a single database were mentioned. It was considered that some technical questions remain open for the time being. The paper proposed the establishment of a close IALA-IHO liaison on the light numbering development in particular and additionally, the harmonisation of the light numbering systems between the IHO and the IALA to the widest extent.

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<sup>1</sup> IALA chooses the term Maritime Resource Names of the concept of a Persistent Unique Identifier in order to expand it into VTS and waterway management and other areas of maritime activity.

### 3. DISCUSSION

PUIs are needed in order to maintain data object identity as data objects pass through the data chain, are stored in different data stores, transformed to different formats, and re-purposed for different domains. The same chunk of information may be present in different data stores in different formats (ISO 8211, XML, relational database record, etc.). Using a persistent identifier for the same chunk of data in all formats and stores will obviously help harmonization, validation, and tracking of data across multiple application domains and at different places in the data supply chain. Similarly, for data integration, especially references to features in a different data products and data-sets from the referring feature, require persistent identity.

Uniform Resource Names (URN) as defined by the IETF (Internet Engineering Task Force, which has standardised protocols like IP, http, FTP and other Internet protocols) are intended to serve as persistent, location-independent, resource identifiers and are designed to make it easy to map other namespaces (which share the properties of URNs) into URN-space. Therefore, the URN syntax provides a means to encode character data in a form that can be sent in existing protocols, transcribed on most keyboards, etc. The URN syntax provides a mechanism to ensure the uniqueness of the name of a resource.

This Guideline describes how the URN methodology is applied to identifying maritime resources within a MRN. This syntax allows decentralisation of the management of identities. It is envisaged that already existing numbering schemes can be fitted into this syntax relatively easily, providing backwards compatibility, while the syntax is extendable to new areas of application.

### 4. REQUIREMENTS

Essential properties for a naming scheme are the following:

- **Uniqueness:**  
Every identifier (ID) that is created must differ from any other ID that is created; however, an object may have more than one MRN assigned to describe the instance or intended purposes in similar or different domains.
- **Decentralisation:**  
It must be possible to create IDs without relying on a single global source that must be used every time an ID is created. A central source for creating specific types of ID, for example, route ID, may exist.
- **Forward compatibility:**  
A global naming scheme must be designed for evolution enabling the addition of new naming schemes for new maritime domains in the future.
- **Flexibility:**  
The naming scheme must be flexible and allow for identifying any type of resource such as documents, routes, equipment, ships and mariners, giving no preference to any specific type of IDs.

There are also a few properties that are 'nice to have' for a global naming scheme:

- **Human readability:**  
A naming scheme should be readable by humans in such a way that identifiers can be entered in forms and documents.
- **Contextual:**  
A naming scheme should provide information on the type of resource that a particular identifier refers to such as, a vessel, mariner, AtoN, port or VTS centre.

- Backward compatibility:

Different maritime naming schemes already exist which include IMO numbers, MMSI numbers and various forms of AtoN identification. A naming scheme allows for integration with these existing schemes as they will continue to be used.

## 5. MARITIME RESOURCE NAME SYNTAX

### 5.1. MANAGEMENT OF MRN NAMESPACES

The MRN syntax is based on the URN as described in RFC 2141 published by the Internet Engineering Task Force (IETF).

All URNs have the following syntax. Phrases enclosed in quotes are REQUIRED:

`<URN> ::= "urn:" <NID> ":" <NSS>`

where <NID> is the Namespace Identifier; and <NSS> is the Namespace Specific String. The leading "urn:" sequence is case-insensitive, but is conventionally written in lower case. The NID namespace for the maritime domain is MRN, therefore:

`<URN> ::= "urn:mrn:" <NSS>`

The namespace, "mrn" is case-insensitive in processing but is conventionally written in lower case.

#### 5.1.1. RULES THAT APPLY TO ALL MRN NAMESPACES

The urn:mrn namespace is fixed and is administered by IALA. The identifier has a hierarchical syntax. MRN defined using the Augmented Backus-Naur Form (ABNF) as specified in RFC 5234 is described below.

The OID and OSS namespaces are equivalent to the NSS namespace in RFC 2141, therefore:

"urn:mrn:"<NSS> is equivalent to "urn:mrn:" <OID> : <OSS> where NSS is the Namespace Specific String composed as follows:

`<NSS> ::= <governing-organization> ":" <type> ":" <type-specific-part>`

`<MRN> ::= "urn" ":" "mrn" ":" <OID> ":" <OSS>`

[ rq-components ]

[ "#" f-component ]

where:

`<OID> ::= (alphanum) 0*32(alphanum / "-") (alphanum) ; Organization ID`

`<OSS> ::= <OSNID> ":" <OSNS> ; Organization-specific string`

`<OSNID> ::= (alphanum) 0*32(alphanum / "-") (alphanum) ; Organization-specific namespace ID`

`<OSNS> ::= pchar *(pchar / "/" ) ; Organization-specific namespace string`

Rules not defined here:

\_alphanum and pchar as defined in RFC 3986.

rq-components and f-component as defined in RFC 8141. q-component, f-component and r-component are not generally defined by this specification. Organization specific namespace strings might choose to make use of them where applicable.

### 5.1.2. CHARACTER SET AVAILABLE

<NSS> ::= 1\*<URN chars>

<URN chars> ::= <trans> | "%" <hex> <hex>

<trans> ::= <upper> | <lower> | <number> | <other> | <reserved>

<hex> ::= <number> | "A" | "B" | "C" | "D" | "E" | "F" | "a" | "b" | "c" | "d" | "e" | "f"

<other> ::= "(" | ")" | "+" | "," | "-" | "." | ":" | "=" | "@" | ";" | "\$" | "\_" | "!" | "\*" | ""

<upper> ::= "A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" | "I" | "J" | "K" | "L" | "M" | "N" | "O" | "P" | "Q" | "R" | "S" | "T" | "U" | "V" | "W" | "X" | "Y" | "Z"

<lower> ::= "a" | "b" | "c" | "d" | "e" | "f" | "g" | "h" | "i" | "j" | "k" | "l" | "m" | "n" | "o" | "p" | "q" | "r" | "s" | "t" | "u" | "v" | "w" | "x" | "y" | "z"

<number> ::= "0" | "1" | "2" | "3" | "4" | "5" | "6" | "7" | "8" | "9"

<reserved> ::= "%" | "/" | "?" | "#"

The <reserved> set is reserved from normal use as specified in RFC 2141. The '%' character is used for encoding the escape sequence of an octet. If a reserved character is used in an MRN, it must be encoded using the appropriate %-encoding. While permitted, the use of a character from the <reserved> set in MRNs is discouraged, except that they may be used with r-, q-, or f-components as specified in RFC 8141.

The entire URN is case-insensitive.

## 5.2. MANAGEMENT OF THE "INT" AND "IALA" NAMESPACES

The MRN syntax for IALA namespaces are defined in the Namespace Specific String (NSS) section of the MRN identifier.

<NSS> is composed as follows:

<NSS> ::= '<governing-organization>': '<type>': '<type-specific-part>'

Inserting 'iala' or 'int' as <governing-organization> will create namespaces where IALA can define unique type identifiers that must contain a minimum of 3 lower case alphanumeric characters:

urn:mrn:iala: '<type>': '<type-specific-part>'

Examples of 'types' include: aton (AtoN), wwy (Waterway), vts (VTS Name), etc.

The 'int' namespace is a wildcard that is reserved for use when it impractical to assign a governing organization, including for example 'iala', 'a country' or 'a service provider'. Use of the 'int' namespace is intended to be temporary and may, for example, be used while any competent organization is established, while assignment is pending, or for test purposes.



It is important to note that some data formats that use Uniform Resource Identifier (URI) namespaces (GML, XML, RDF, OWL) may give specific meaning to parts of the MRN ID, such as GML where the colon has special significance. MRNs therefore cannot be used verbatim for GML identifiers (“gml:id”) or tags. Instead, for GML formats, either MRNs should be used as values for an attribute designed to carry identifiers, or translated into a format compatible with GML, or rules for mapping GML identifiers to MRNs should be defined.

**Table 1** *Examples of translating a URN identifier into a GML accepted identifier*

URN ID Example	GML acceptable ID version
urn:mrn:iala:aton:us:1234.5	us-1234.5
urn:mrn:iala:aton:js:cg:54321678	js.cg.54321678

The ‘:’ (colon) character has been translated into a ‘-’ (dash) or a ‘.’ (punctuation), and the urn:mrn:iala:aton: part has been omitted as this part would always be fixed in the product. Additional parts of the URN ID could be omitted, but the retained parts yield an ID that is still human readable as well as machine-processable in the same way as the original MRN.

## 5.2.1. NAMESPACE EXAMPLES

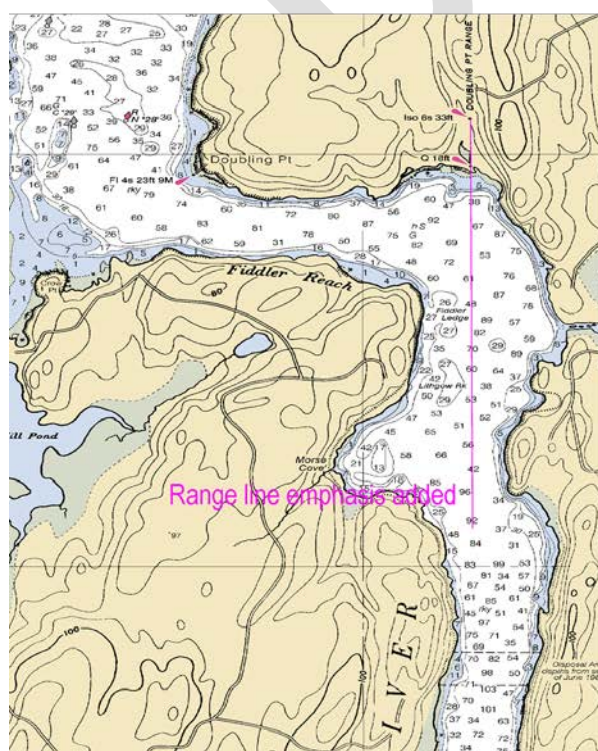
The identifiers related to AtoN use a schema allowing for decentralised management of their identifiers. This scheme includes <ISO 3166 Code>:<managed name spaces>, where <ISO 3166 Code> is the identifier defined by ISO 3166-1 alpha-2 codes for the representation of names of a country, territory, or area of geographical interest.

For example:

urn:mrn:iala:aton:us:1234.5

urn:mrn:iala:aton:gb:sco:1234.5

It is envisaged that for <managed name spaces> all existing naming/numbering schema within a country, territory, or area of geographical interest could be re used to a large degree. See Annexes for further detail.



- Feature: Recommended Track
  - Attribute: category of recommended track: Based on a system of fixed marks
  - Attribute: orientation: 270 degrees
  - Attribute: MRN: urn:mrn:iala:aton:us:12345678
- Feature: Navigational Line
  - Attribute: category of navigation line: leading line bearing a recommended track
  - Attribute: orientation: 270 degrees
  - Attribute: MRN: urn:mrn:iala:aton:us:87654321
- Feature: Landmark
  - Attribute: category of landmark: tower
  - Attribute: function: light support
  - Attribute: MRN: urn:mrn:iala:aton:us:cg:54321678
- Feature: Light
  - Attribute: category of light: leading light
  - Attribute: colour: white
  - Attribute: MRN: urn:mrn:iala:aton:us:cg:45678122
- Feature: Landmark
  - Attribute: category of landmark: tower
  - Attribute: function: light support
  - Attribute: MRN: urn:mrn:iala:aton:us:cg:54321679
- Feature: Light
  - Attribute: category of light: leading light
  - Attribute: colour: white
  - Attribute: MRN: urn:mrn:iala:aton:us:cg:45678123
- Feature: Range System
  - Attribute: name: Micklefirth approach range
  - Attribute: MRN: urn:mrn:iala:aton:us:cg:23456781
- Aggregation: Range System Aggregation
  - Consists of: MRN: urn:mrn:iala:aton:us:cg:12345678
  - Consists of: MRN: urn:mrn:iala:aton:us:cg:87654321
  - Consists of: MRN: urn:mrn:iala:aton:us:cg:54321678
  - Consists of: MRN: urn:mrn:iala:aton:us:cg:45678123
  - Consists of: MRN: urn:mrn:iala:aton:us:cg:54321679
  - Consists of: MRN: urn:mrn:iala:aton:us:cg:45678122

**Figure 1** *Example of multiple Domain and Namespace use*



### 5.3. EXTENDABILITY

The MRN is intended to be an extendable mechanism across the maritime domain.

#### 5.3.1. EXTENDED APPLICATIONS WITHIN THE IALA NAMESPACE

IALA will extend the set of MRN type namespaces as appropriate. Definitions of new areas of application of the namespace within the specific domain will be published as additional or amended annexes to this Guideline.

## 6. AREAS OF APPLICATION

### 6.1. IALA NAMESPACE

This Guideline provides the following identifier <type> specific definitions of syntax constraint under the IALA namespace in Annex A, with the following Sections:

***Table 2 Current Areas of application of MRN within IALA Namespace***

ID types	Syntax constraint
Marine Aids to Navigation	ANNEX A, Section A1
VTs services	ANNEX A, Section A2
Waterways	ANNEX A, Section A3
Publications	ANNEX A, section A4
Object	ANNEX A, section A5

### 6.2. USE OF WILDCARD NAMESPACE ('INT' NAMESPACE)

This Guideline provides a description of the wildcard INT namespace in Annex B.



## 7. ACRONYMS

<b>ABNF</b>	Augmented Backus-Naur Form
<b>AtoN</b>	Marine Aid(s) to Navigation
<b>HO</b>	Hydrographic Office
<b>IALA</b>	International Association of Marine Aids to Navigation and Lighthouse Authorities
<b>ID</b>	Identification / Identity / Identifier
<b>IETF</b>	Internet Engineering Task Force
<b>IHO</b>	International Hydrographic Organization
<b>IMO</b>	International Maritime Organization (UN)
<b>IP</b>	Internet Protocol
<b>ISO</b>	International Organization for Standardisation
<b>MMSI</b>	Maritime Mobile Service Identity
<b>MRN</b>	Maritime Resource Names
<b>MSI</b>	Marine Safety Information
<b>NID</b>	Namespace Identifier
<b>NSS</b>	Namespace Specific String
<b>PUI</b>	Persistent Unique Identifier
<b>RFC</b>	Request for comments (IETF)
<b>UKHO</b>	United Kingdom Hydrographic Office
<b>URN</b>	Uniform Resource Name(s)
<b>VTS</b>	Vessel Traffic Service
<b>XML</b>	eXtensible Markup Language

## ANNEX A    MRN FOR IALA NAMESPACE

### A.1.    MRN FOR MARINE AIDS TO NAVIGATION

A unique identifier for an AtoN should be assigned by the responsible AtoN Authority.

When referenced outside the context of the national AtoN provider, the identifier should be prefixed using the MRN syntax, with the prefix:

urn:mrn:iala:aton:<ISO 3166 Code>:<managed name spaces>.

where <ISO 3166 Code> is the identifier defined by ISO 3166-1 alpha-2 codes for the representation of names of a country, territory, or area of geographical interest.

The MRN authority (e.g. National IALA member) must ensure, that the <managed name spaces> is unique within the domain, and that the syntax of the <managed name spaces> complies with the general MRN guidelines.

Examples:

urn:mrn:iala:aton:us:1234.5 [1]

In example [1] the AtoN with identifier 1234.5 defined by the US AtoN authority.

urn:mrn:iala:aton:gb:sco:6789.1 [2]

In example [2], the ISO 3166 code for the United Kingdom is 'gb'. Within the United Kingdom, AtoN are provided by 3 different AtoN authorities and so a further identifier is used: 'sco' for Scotland in this example where the Scottish asset identifier is 6789.1.

For AtoN Number:

urn:mrn:iala:aton:kr:A01010001 [3]

In example [3] Region(1) + Coast(2) + AtoN Type(2) + unique number(5): A01010001

Region Code

Region1	Region2	Region3	Region4	Region5	Region6	Region7
A	B	C	D	E	F	G

Coast Number

Coast1	Coast2	Coast3	Coast4
01	02	03	04

AtoN Type

Lighthouse	Light Buoy	Buoy	Light Beacon	Beacon	Bridge	Racon
01	02	03	04	05	06	07

For AtoN equipment and structure

urn:mrn:iala:aton:kr:light:17LLED0685 [4]



In example [4] Year + Type + unique number: 17 + LLED + 0685 → 17LLED0685

The equipment/structure type include the following:

Floating Structure, Fixed Structure, Light, Signal, Battery, Controller, Remote Telemetry Unit (RTU), Topmark, Other

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## A.2. MRN FOR VESSEL TRAFFIC SERVICES

A unique type namespace for VTS is assigned by the responsible MRN Authority. This Annex is reserved for description of VTS, bearing in mind that VTS could be described as a whole, or individual VTS components can be described separately.

When referenced outside the context of the VTS provider, the identifier should be prefixed using the MRN syntax, with the prefix:

urn:mrn:iala:vts:<ISO 3166 Code>:<managed name spaces>.

where <ISO 3166 Code> is the identifier defined by ISO 3166-1 alpha-2 codes for the representation of names of a country, territory, or area of geographical interest.

The MRN authority (e.g. National IALA member) must ensure, that the <managed name spaces> is unique within the domain, and that the syntax of the <managed name spaces> complies with the general MRN guidelines.

Examples:

urn:mrn:iala:vts:ca:ecareg [1]

In example [1] the VTS zone identifier for Eastern Canada VTS zone as defined by the Canadian Coast Guard.

urn:mrn:iala:vts:nl:rtd:me [2]

In example [2], the VTS zone identifier for 'rtd' for Port of Rotterdam and 'me' for the Maas entrance to the port.

### A.3. MRN FOR WATERWAYS

A unique type namespace for waterways (wwy) is assigned by the responsible MRN Authority. This Annex is reserved for description of waterways, bearing in mind that waterway could be described as a whole, or individual waterway segments can be described separately.

When referenced outside the context of the waterway, the identifier should be prefixed using the MRN syntax, with the prefix:

urn:mrn:iala:wwy:<ISO 3166 Code>:<managed name spaces>.

where <ISO 3166 Code> is the identifier defined by ISO 3166-1 alpha-2 codes for the representation of names of a country, territory, or area of geographical interest.

Example:

urn:mrn:iala:wwy:us:atl:chba:potri [1]

In example the identifier to the Potomac River waterway using a scalable approach showing the relationships between waterways from national to regional to local level. The name spaces are atl for Atlantic, chba for Chesapeake Bay, and potri for Potomac River

#### **A.4. MRN FOR PUBLICATIONS**

A unique type namespace for publications (pub) is assigned by the responsible MRN Authority. This Annex is reserved for description of publications.

When referenced outside the context of the publication author, the identifier should be prefixed using the MRN syntax, with the prefix:

urn:mrn:iala:pub:<managed name spaces>

or

urn:mrn:iala:pub:<ISO 3166 Code>:<managed name spaces>

where <ISO 3166 Code> is the identifier defined by ISO 3166-1 alpha-2 codes for the representation of names of a country, territory, or area of geographical interest.

Examples:

urn:mrn:iala:pub:g1143 [1]

In example [1] the publication with identifier g1143 defined by IALA.

urn:mrn:iala:pub:ca:cg:ramn:2018 [2]

In example [2], the ISO 3166 code for the Canada is 'ca'. The code for the Canadian Coast Guard within Canada is 'cg', and have issued the Radio Aids to Marine Navigation publication with the code 'ramn'. The year of issue is 2018.



## A.5. MRN FOR OBJECTS AS WILDCARD

A unique type namespace for objects (obj) is assigned by the responsible authorities. Object (obj) is a reserved wildcard for use where it is unknown or impractical to assign another type, the identifier should be prefixed using the MRN syntax, with the prefix:

urn:mrn:iala:obj:<ISO 3166 Code>:<managed name spaces>.

where <ISO 3166 Code> is the identifier defined by ISO 3166-1 alpha-2 codes for the representation of names of a country, territory, or area of geographical interest.

The MRN authority (e.g. National IALA member) must ensure, that the <managed name spaces> is unique within the domain, and that the syntax of the <managed name spaces> complies with the general MRN guidelines.

Examples:

urn:mrn:iala:obj:us:nm:42.42 [1]

In example [1] the flying saucer with identifier 42.42 defined by the US flying saucer authority in New Mexico.

urn:mrn:iala:obj:gb:sco:swan52 [2]

In example [2], the ISO 3166 code for the United Kingdom is gb. Within the United Kingdom, mute swans are tracked by 3 different mute swan authorities and so a further identifier is used: sco for Scotland in this example where the Scottish mute swan identifier is swan52.

## ANNEX B    MRN FOR INT NAMESPACE

IALA recognises that a multitude of different naming schemes exist today, and that various countries have their own usage rules. It is not feasible to create a naming schema that encompasses all possibilities, or force countries to adapt to a rigid system. Therefore, IALA recognises the possibility that “wildcard” characters be identified and used in the MRN namespace, to allow for situations that cannot be foreseen or for those objects that do not correspond exactly with the structure. For this reason, IALA has reserved the “int” namespace to act as a wildcard for use where it is unknown or impractical to assign another namespace as an Organization ID <OID>.

No provision is made for avoiding collision of MRNs within the "int" namespace, but measures should be taken to ensure uniqueness. It is not recommended that implementers use the "int" namespace for any purposes other than documentation, private testing, and experimental contexts.

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