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**Harmonisation of identifiers using Maritime Resource Names (MRN)**

# **Introduction**

1. At its 101st session, the Maritime Safety Committee adopted resolution MSC.467(101), focusing on harmonising the format and structure of Maritime Services in the context of e-navigation. The committee decided to harmonise Maritime Services descriptions and collaborate with international organisations and Member States to enhance information and data exchange. Additionally, it encouraged Member States and international bodies to contribute their Maritime Services descriptions, aligning with the resolution's guidelines.
2. The use of unique identifiers is a necessary development of Maritime Services[[1]](#footnote-1) in the context of e-navigation to maintain harmonisation across domains, services, and bodies. Maritime resources, such as Marine Aids to Navigation (AtoN), Vessel Traffic Service (VTS), waterways and authorities, require unique identification to avoid duplication and misalignment when referenced. Currently, there is no overarching system that allows to specify maritime identifiers in the context of e-navigation in a uniform and unambiguous way.
3. Global harmonisation using unique identifiers for maritime resources is necessary for:
   1. the development and maintenance of enhanced data exchange applications for ship-to-ship, ship-to-shore, shore-to-ship and shore-to-shore
   2. efficient administrations and delivery of Maritime Safety and SAR information by the ability to reference resources independently from a communications bearer.
   3. interoperability between existing administrative and/or operational systems and those being developed for Maritime Services while maintaining backward compatibility.
4. Maritime Resource Names (MRNs) are a universal naming scheme for maritime resources on a global scale. They are persistent, location-independent, resource identifiers designed to make it easy to map to other namespaces. MRN is a registered domain within Uniform Resource Name (URN)[[2]](#footnote-2) which is a standardised and proven architecture from the internet domain.

# **Background**

1. MRN is decentralised by nature and each organisation could have their own dedicated namespace in the MRN scheme. The MRN scheme consists of 3 required parts:
   1. urn:mrn – static part that every MRN begins with
   2. <oid> – ID of the coordinating organisation of the type of resource
   3. <id> – the identification part. It’s recommended to use a resource type as part of the id
2. The <oid> part within an MRN signifies the coordinating organisation of the type of resource. The organisation determines the structure of the subsequent "id" section of the MRN. Therefore, it is rarely the actual owner of the resource.
3. The syntax of the <id> part of the MRN is managed by the coordinating organisation(oid). There are no rules for how to construct the ID part, other than ensuring uniqueness of each MRN. It’s recommended to contain the type of the resource and further resource information, such as an authoritative source of the resource combined with the actual ID of the resource. The example MRN below references a fictional Aid to Navigation (AtoN), managed by the Australian AtoN authority, AMSA, in Queensland with the id number “2389-4”.  As IALA is the coordinating organisation for AtoNs, they define the syntax of the ID part, which is *:aton:<country>:<id>*. AMSA is the authoritative organisation of the resource and can use whatever text/number in the <id>-part as they see fit. In the example, AMSA has chosen to have an area (Queensland qld) combined with a number.

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1. The concept of MRNs has been adopted by various maritime stakeholders. MRN is an integral part of the S-100 standard, and all resources described in a S-100 product specification should have an MRN.
2. The broad adoption of MRNs will have several implications:
   1. MRNs will simplify the integration of different layers of data on an ECDIS by referencing (chart) features in route plans, navigational warnings, and other types of data.

* 1. Data management systems and databases will benefit from a harmonised naming schema.

* 1. New maritime services will rely on the existence of MRN databases and processes for assigning MRNs.

1. There are many use-cases in which MRN can help to harmonise the management of maritime resources. Annex A provides seven example use-cases and possible benefits of using MRN.

# **MRN implementation**

1. Coordinating organisations looking to start with the implementation of the MRN concept can initiate the process by following a few key steps:
   1. Review the available guidance documents provided by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)[[3]](#footnote-3).
   2. Assess their specific needs and determine a list of requirements for the implementation of MRN. This includes the determination of types of resources that require MRN assignment. Common resources that require MRN assignment can be found in the examples in Annex A.
   3. Organisations should apply for an OID at IALA by filling out an application form and submitting it to the IALA Secretariat (see IALA G11641).
   4. Organisations should formally define the structure of the identification part (resource type and resource information) of the their namespace in a (internal) specification. As MRNs will be utilised in many different systems by multiple stakeholders, it is important to maintain a standardised approach even for the assignment of the identification part of an MRN. An example of a formal MRN specification is given by the Identity Management specification of the Maritime Connectivity Platform[[4]](#footnote-4).
   5. Establish internal processes to issue MRNs, test MRN issuing in a non-critical environment, integrate MRNs into existing processes and information systems and ensure that relevant stakeholders are trained on MRN implementation and usage.
   6. Consider existing naming or numbering systems, and how MRN implementation may be structured in such a way to incorporate existing schemas (for ease of implementation).
   7. Consider how formal processes will be documented, maintained, and made available for users and implementers to reference. Common registries and online libraries may be utilized.
   8. If required, make information that is associated with an MRN (such as a digital identity, URL, resource description, etc.) available via a digital resource registry service.
2. Further guidance can be found in documentation provided by the Internet Assigned Numbers Authority (IANA)[[5]](#footnote-5), IALA[[6]](#footnote-6) and the Internet Engineering Task Force (IETF)[[7]](#footnote-7).
3. Member States are invited to bring this information to the attention of all parties concerned.

**ANNEX A**

**USE-CASES FOR MARITIME RESOURCE NAMES**

# **Introduction**

1. The introduction of MRN offers a comprehensive solution for national maritime agencies, other government actors, and industry to implement a uniform naming scheme. Currently, multiple identification schemas exist for maritime resources in independent systems, lacking standardisation and interoperability. MRN introduces a consistent scheme to identify any maritime resource on a global scale. This encompasses a wide range of entities such as vessels, AtoNs, organisations, or digital maritime services.
2. Managing information about the same resource in many different information systems leads to inefficiency, inconsistency, and errors. Resolving these issues often involves manual human intervention, leading to extended processing times, for example issuing vessel or competency certificates. A more critical inefficiency emerges in the case of search and rescue operations where operators manually compile information from several different sources (e.g., information from AIS, LRIT, ship registers, public websites, etc.). The use of a unique MRN assigned to a digital identity could streamline the process of aggregating and interacting with diverse information from multiple sources about a single vessel.
3. Maritime digital services require interoperability on a global scale to enable seamless information exchange. Using MRN as a base layer of referencing for maritime resources, facilitates coordination (inter and intra organisational), make trade operations more efficient and improve overall maritime safety. MRN’s adaptability allows for customisation to meet specific organisational needs, making it a valuable tool for different use-cases. The following section presents several use-cases that show the benefits of utilising MRN.

# **List of Use-Cases**

## *UC1: S-100 Features and Chart references*

***Description****:* IHO’s S-100 Universal Hydrographic Data Model was recognised by the IMO as the common maritime data structure (CMDS) as part of the e-navigation strategy and will be used in modern ECDISs starting from 2026. S-100 relies on MRNs to reference features in S-100 based data models. Examples are references to chart features in S-101 or references to navigational warnings in S-124. Using MRNs in different data models significantly enhances interoperability: By cross-referencing features, such as navigational warnings, AtoN information, water level information, planned route, etc., MRNs will facilitate provision of a harmonised situational picture to the mariner on a single information display.

***Example MRNs:***

urn:mrn:iho:s101:jsho:87654321

urn:mrn:iho:s124:navwarn:navarea-x:auscoast:223

## *UC2: AtoN Management*

***Description****:* Managing Aids to Navigation efficiently is crucial for ensuring safe navigation. Each navigational aid has unique characteristics and maintenance requirements. This often involves coordination with different contractors and the exchange of AtoN datasets. Additionally, AtoNs are frequently referenced in information provided to mariners (notices to mariners, navigational warnings, list of lights). MRNs can be utilised to streamline management and publication processes by uniquely identifying AtoNs. Additionally, growing use of electronic AtoN (e.g., AIS AtoN) to supplement the marking of hazards to navigation, particularly temporary hazards is expected. Digitalisation technologies (such as virtual and synthetic AtoNs, MRNs, S-100 data models) have been shown to improve the efficiency, cost-effectiveness, and safety impact of AtoNs. These technologies heavily rely on the presence of globally harmonised identifiers as well.

***Example MRNs:***

urn:mrn:iala:aton:us:1234.5

urn:mrn:iala:aton:gb:sco:6789.1

urn:mrn:iala:aton:kr:A01010001

## *UC3: MRNs for Geographical Locations*

***Description****:* Many geographical locations have multiple names, causing communication complexity and interoperability issues of different data sets (such as internal databases or chart data). Using MRNs simplifies this by assigning a unique identifier to each location. This enables cross-referencing and standardised communication and reduces human error caused by name ambiguity. These MRNs can also be utilised for the delivery of critical Maritime Safety Information to vessels enhancing overall safety and navigation efficiency.

***Example MRN schema:***

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

Countries: e.g., urn:mrn:iho:country:dk

Area (Firing Area): urn:mrn:iho:fa:dk:<internal area id> e.g., urn:mrn:iho:fa:dk:es-d-140

## *UC4: Maritime Messaging and Group Calling*

***Description****:* Effective communication is a fundamental requirement for safe navigation. Traditional methods, such as radio calls and email exchanges, are not suitable for the exchange of new digital data to enhance navigation safety. Utilising MRNs for maritime messaging enables precise addressing, group calling, and global interoperability. An MRN-enabled message exchange would include the MRNs of sender and recipient of a message, coupled with their respectively digital identity. This would enable end-users to validate message authenticity and encrypt confidential information, when combined with a Public-Key infrastructure[[8]](#footnote-8) (PKI).

***Example MRNs:***

*urn:mrn:mcp:entity:amsa:jane-doe (sender)*

*urn:mrn:mcp:entity:bsh:erika-mustermann (recipient)*

*urn:mrn:mcp:mms:sternula:main (messaging infrastructure component, e.g. part of a satellite comms architecture)*

## *UC5: Using MRNs to Represent Existing Identifiers*

***Description****:* The maritime domain relies on established identification systems like the Maritime Mobile Service Identity (MMSI) or the IMO number for vessels. While it is unlikely that the new MRN schema will replace these existing systems, MRNs can serve as a compatibility layer. Facilitating the integration of traditional identifiers into systems that utilize MRNs, ensuring seamless interoperability.

***Example MRNs:***

urn:mrn:itu:mmsi:538070999

urn:mrn:imo:imo-number:9743368

## *UC6: Official Publications*

***Description****:* Official publications from IMO and other organisations (IHO, IALA, IEC, etc.) play an important role in regulating the maritime industry and providing guidance to a range of stakeholders. Using MRNs can contribute to efficiently managing these documents by facilitating references to different versions and simplifying access for maritime professionals. By assigning an MRN to each official document, it becomes simpler to identify, find, or access any specific publication. This includes the management of different revisions of documents and streamlining record-keeping by linking an MRN to a document’s publication date, author, and other relevant metadata.

***Example MRNs:***

urn:mrn:iala:pub:g1143:ed3.1 (IALA GUIDELINE G1143: UNIQUE IDENTIFIERS FOR MARITIME RESOURCES)

urn:mrn:imo:pub:circular:msc1:1610 (INITIAL DESCRIPTIONS OF MARITIME SERVICES

IN THE CONTEXT OF E-NAVIGATION)

## *UC7: Identification of Maritime Services*

***Description****:* As part of IMO’s e-navigation strategy, several maritime services have been identified that will be provided by different entities to enhance navigation safety and increase efficiency. These include weather updates, navigational charts, maritime safety information, vessel traffic services and many others. The specification of these services happens on different levels (operational specification, general technical description, description of specific instances). MRNs can be used to make these services and their specifications more accessible and facilitate automated service discovery.

***Example MRN:***

*urn:mrn:iho:techsvc:spec:navwarn (Technical service specification (document) for navigational warnings service)*

*urn:mrn:iho:techsvc:instance:navwarn:navarea-1:dk:v1 (Operational service instance of the navigational warning service (version 1) for Denmark in NAVAREA 1 – resolves to a service endpoint)*

# **Implementation of Use-Cases**

1. MRNs are organised in a decentral way, meaning that every owner of an OID is responsible for managing their namespace. To ensure that MRNs can be resolved to the referenced resource, organisations can provide a Maritime Resource Registry (MRR). The concept of MRRs works similar as the Domain Name System (DNS) that is used to resolve hostnames on the internet to IP addresses (e.g., imo.org -> 20.68.185.168). As IALA is the owner of the urn:mrn namespace, a root MRR would be provided by IALA and every registered OID-owner could provide their MRR as a sub-system as depicted below.



# **Use-Cases: Conclusion**

1. In summary, Maritime Resource Names hold significant potential to contribute to the digital transformation of the maritime industry. Their adaptability extends over a range of applications, from simplifying communication and enhancing safety, to making internal administrative processes more efficient. MRNs offer a standardised and interoperable approach to addressing the diverse needs of the maritime sector.

1. As defined in MSC.467(101) [↑](#footnote-ref-1)
2. See [RFC 8141: Uniform Resource Names (URNs) (rfc-editor.org)](https://www.rfc-editor.org/rfc/rfc8141.html) [↑](#footnote-ref-2)
3. IALA G1143: Unique Identifiers for Maritime Resources

   IALA G1164: Management of Maritime Resource Name Organisation Identifiers

   IALA R1023: Maritime Resource Names [↑](#footnote-ref-3)
4. Available online: <https://maritimeconnectivity.github.io/maritimeconnectivity.net/docs/MCP%20IDsec2%20MCC%20Identity%20Management%20and%20Security;%20Identity%20Management.pdf> [↑](#footnote-ref-4)
5. IANA describes MRN in <https://www.iana.org/assignments/urn-formal/mrn> [↑](#footnote-ref-5)
6. IALA describes MRN in their domain and has several guidelines <https://www.iala-aism.org/technical/data-modelling/mrn/> [↑](#footnote-ref-6)
7. IETF describes URN in <https://www.rfc-editor.org/rfc/rfc8141> [↑](#footnote-ref-7)
8. This concept is currently applied by the Maritime Messaging Service, that is developed by the Maritime Connectivity Consortium as part of the Maritime Connectivity Platform. [↑](#footnote-ref-8)