 Input paper: ENAV17-n.n.n

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 Maritime Resource Name

# Summary

This document contains a proposal for a naming scheme called *Maritime Resource Names (MRN)* that can be used for uniquely identifying any maritime resource on a global scale.

The MRN naming scheme is based on the concepts of Uniform Resource Identifiers (URI) which is a cornerstone of the Internet.

## Purpose of the document

This document is related to the development of the Maritime Cloud communication framework. The intention is that this identifier scheme could be used for the Maritime Cloud itself, but if it would also be used in other systems within the maritime domain, then this would make interoperability between these systems much easer (cheaper) to achieve.

# Introduction

Even though it is difficult to imagine today, most houses and buildings were not numbered, until the advent of the modern postal system. Some streets might have been named, for example from the professions of their inhabitants, or from a landmark such as a city gate or market. However, when postal systems were introduced, it became necessary to take a more structured approach to aid mail delivery. Buildings were numbered and postal codes were introduced. It did not mean that every country used the exact same system for numbering building and/or streets, but there was enough structure in the system to make it possible to send a letter or parcel from almost any place in the world to almost any other place.

There are numerous other examples of global identifiers that have made great leaps of progress possible. For example, the advent of modern telephony would have been impossible without a global naming scheme for (international) phone numbers. Likewise, the WWW (World Wide Web) would probably never have been so successful without the relative simple usage of global URLs (Uniform Resource Locators) that people can enter into a browser.

A key part in service-oriented economy is the concept of network-based, automated transactions. These transactions almost always need to identity the source, receiver and resources that participates in the transaction. Not only are these transactions central to businesses, but organizations have an ever increasing need to identify employees, resources, systems, and services in a systematic way to ensure the agility of their business as well as securing their business assets. In short, in the digitally service-oriented economy that the maritime industry (and many other industries) are moving towards, digital identity is something that matters. And with the advent of the "Internet of Things" where billions of devices will be connected, the need for digital identities will only be of ever increasing importance.

Although a lot of identifier schemes for vessels, buoys, mariners already exist in the maritime domain. There is no single system that allows people to specify such an identifier in a uniform and unambiguous way.

We believe that it makes sense to introduce a naming scheme that can uniquely identify any maritime resource on a global scale. By maritime resource we basically mean anything that has an identity of some kind. This could be organizations, employees, a person, a physical or a virtual object, for instance an electronic document, a buoy, a ship, a mariner, a nautical chart or an electronic service (e.g., "today's weather report for the Oresund Strait"). Not all resources are "retrievable" in an electronic sense; For example, human beings, corporations, and buoys. However, they can still be considered a resource.

We believe that having such a naming scheme will facilitate innovation, integration, trade, safety, and security in the maritime sector, by paving the way for new kind of maritime digital information services.

# Requirements

Having worked on identity management during the last couple of years we have identified a number of properties which we believe are essential for a global naming scheme.

We have split the list of properties into two parts. Properties we believe a naming scheme must have and properties that we believe are nice to have.

The essential properties we believe a naming scheme must have, are the following:

* **Unique.** Every id that is created must differ from any other id that is created.
* **Decentralized.** It must be possible to create ids without relying on a single global source that must be used every time an id is created. Essentially creating a single point of failure for the entire maritime sector. This, however, does not mean that there cannot be a central source for creating specific types of ids, for example, route ids. Similar to how creation of domain names are often delegated to various entities that each control a subdomain such as '.org', '.com', ‘.uk’ or ‘.no’.
* **Forward compatible.** It must be possible to add new naming schemes for new maritime domains in the future. In other words, a global naming scheme must be designed for evolution. Technologies will only come and go with an ever increasing rate in the coming years.
* **Flexible.** The naming scheme must be very flexible and allow for identifying any type of resource such as documents, cargo, routes, equipment, ships and mariners, giving no preference to any specific type of IDs.

There are also a number of properties we believe that are \*nice to have\* for a global naming scheme:

* **Human readable.** A good naming scheme should be readable by humans in such a way that identifiers can be entered in forms and documents. Otherwise a simple solution such as creating a random 128-bit UUID similar to ‘de305d54-75b4-431b-adb2-eb6b9e546014’ would be the easiest solution.
* **Context.** A good naming scheme should give some idea of the *type* of resource that a particular identifier refers to. For example, is the identifier referring to a vessel, mariner, container, ATON, port or VTS center?
* **Backward compatible.** A lot of different maritime naming schemes already exist: IMO numbers, MMSI numbers and various forms of AtoN identification. A good naming scheme should allow some kind of integration with these existing schemes as they will continue to be used for many years to come.
* **Existing standards.** Preferable we should build upon ideas and standards that have already proven useful in other sectors.

# Uniform resource identifier (URI)

Before describing our proposed naming scheme, we need to give a short introduction to the concepts of URI/URL/URN as they form the basis of our proposal.

Most people are already familiar with URLs as they enter various URLs into a browser on a everyday basis. However, most people are not familiar with the related concepts of URIs and URNs which also plays a central role in computing.

A uniform resource identifier (URI) is defined in RFC 3986[[1]](#footnote-1) as a compact sequence of characters that identifies an abstract or physical resource. The most frequently used type of URIs is the uniform resource locator (URL), frequently just referred to as a web address. Another, less commonly used, type is the uniform resource name (URN) that identifies a resource by name in a particular known namespace.



A Uniform Resource Name (URN) functions like a person’s name, while a Uniform Resource Locator (URL) resembles that person’s street address. In other words: the URN defines a resource’s identity, while the URL provides a method for finding it.

Perhaps an example can best clarify this: the ISBN number used for a book is a URN as it is an unambiguous identifier for a given book. But a ISBN number is not a URL as it does not define where a particular book can be found or located.

# URN Industry Examples

A number of international organizations have already chosen to use URNs as the basis for identifying “things”. We will give a short description of three of these.

## Electronic Product Code

The Electronic Product Code[[2]](#footnote-2) is designed as a universal identifier that provides a unique identity for every physical object anywhere in the world, for all time. It has been developed by more than 100 companies such as Nestle, Intel, Unilever, Gillette, NTT and it is currently maintained by GS1.

A concrete example taken from the documentation is

*urn:epc:id:grai:0614141.12345.400*

where the first part *urn:epc:* is used for distinguishing the identifier from other URNs from different organizations. The *id:grai* indicates a specific type of identifier called a G*lobal Returnable Asset Identifier* which is used to identify a specific returnable asset, such as a reusable shipping container or a pallet skid. The *0614141* part is the GS1 company prefix, assigned by GS1 to a managing entity. The *12345* part is the asset type, assigned by the managing entity to a particular class of asset. Finally, the *400* part is a serial number, assigned by the managing entity to an individual object.

Other examples include:

*urn:epc:id:usdod:2S194.1234567890*1

Where *id:usdod* indicates a US Department of Defense Identifier. Identifiers of this type is typically used by suppliers of items and services to the US Department of Defense.

*urn:epc:id:cpi:0614141.123ABC.123456789*

Identifiers starting with *urn:epc:id:cpi*, also called a Component Part Identifier, is used by technical industries (including the automotive sector) for the unique identification of parts or components.

A frequent usage of EPC URNs is to encode them onto a RFID tag. In which case items can be easily tracked throughout the whole supply chain.

**ISO**

The International Organization for Standardization (ISO) uses URNs to name all their standards[[3]](#footnote-3). Some concrete examples:

The 1st edition of ISO 9999-1, in English

*urn:iso:std:iso:9999:-1:ed-1:en*

The 1st edition of ISO 9999-1, in English/French

*urn:iso:std:iso:9999:-1:ed-1:en,fr*

The corrected English version of the 1st edition of ISO 9999-1

*urn:iso:std:iso:9999:-1:ed-1:v2:en*

The 2nd version of Amendment 1, in English, which amends the 1st version of edition 1 of ISO 9999-1, in English/French

*urn:iso:std:iso:9999:-1:ed-1:v1:en,fr:amd:1:v2:en*

## URN lex

URN lex is URN namespace that allows accurate identification of laws and other legal norms. The namespace has currently been adopted by the legal system in Brazil and Italy.

Some concrete examples:

Brazilian Constitution of 1988:

*urn:lex:br:federal:constituicao:1988-10-05;1988*

Law nº 11.705, of June 19, 2008, known also as "Brazilian Prohibition":

*urn:lex:br:federal:lei:2008-06-19;11705*

Decision of the Italian Constitutional Court No.7 of 23 January 1995:

*urn:lex:it:corte.costituzionale:sentenza:1995-01-23;7*

As can be been seen from all these examples URNs provide a simple, standardized, readable and highly versatile mechanism for creating unique identifiers that can be adopted by different domains.

# Maritime Resource Names (MRN)

Having introduced and explained the difference between between URIs/URNs/URLs we can now describe our proposal for the Maritime Resource Name (MRN) scheme.

The purpose of the "mrn" namespace is to assign an unequivocal identifier, in standard format, to entities with a relation to the maritime domain. The identifier is conceived so that its construction depends only on the characteristics of the resource itself and is, therefore, independent from the resource's on-line availability, its physical location, and any mode of access.

## Syntax

The identifier has a hierarchical structure as follows:

           *"urn:mrn:"<NSS>*

where NSS is the Namespace Specific String composed as follows:

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

The easiest way to explain this syntax is with a couple of examples with some well known entities. All the examples provided in the following section are hypothetical examples. Any final naming scheme for a specific type of maritime resources will most likely look different.

A vessel with an IMO number of 9743368 could be identified as follows:

*urn:mrn:imo:imo-number:9743368*

The governing organization of *IMO-number* is IMO. IMO may have delegated the actual assignment of numbers to another company. But IMO is still the organization who has determined that an IMO number is a unique seven-digit number. Hence the governing-organization of the imo-number identifier will be *IMO.* The type *imo-number* is a reference to the type of identifier. This name is something the governing organization decides upon internally. In this example we have used *imo-number* but it could just as well have been *imo:imonumber* or just *imo:number.* Finally, what follows after the governing organization and the type part is the *type specific part* which in this case is 9743368. The type specific part is (as the name implies) specific to the combination of governing organization and type. In this case the type specific part is always a 7 digit IMO number.

Another way to identify the vessel might be to use its MMSI number. Here the identifier might look like this:

*urn:mrn:itu:mmsi:538070999*

In this case ITU is the governing body because MMSI numbers are based on recommendation M.585 from ITU. It might be that national bodies does the actual assignment of MMSI numbers, but ITU is the governing body for the standardization of MMSI numbers.

As can be seen from this two examples. The same vessel can be identified by multiple different identifiers. This is no different to a person who might be identified both by this driver license number or his social security id. Multiple identities can identify the same entity. But some parameters frequently used for identification, such as ‘names’, may not qualify as identifiers, as they are not guaranteed to be unique. A single identifier must refer to one and only one identity.

The concept of URNs can be taken from a very coarse grained level to a very fine grained level. For example, a container ship might be identified by one of the two previous URL’s. The containers aboard the ship might be identified with an URN adapting the ISO 6346 identifier scheme for container ids.

*urn:mrn:bic:container-id:CSQU3054383*

Finally, individual items in a single container might be identified by another URN scheme. It might even be possible to integrate with URNs defined outside of the *urn:mrn* namespace. For example, all items in a container might use the EPC scheme that was described in the previous section of example URNs. In other words, the usage of URNs as identifiers are not limited to those defined within this document. In the future other non-maritime sectors might even adopt a similar scheme based on URNs in order to facilitate easier integration across sector boundaries.

An identifier does not need to be a physical object. It can also be something like an electronic document.  For example, IMO might decide that all of their documents would use a "urn:mrn:imo:publications" prefix. So

*urn:mrn:imo:publications:IF110S*

would refer to the publication "IMO SOLAS Consolidated Spanish Edition, 2014 IF110S"

On the other hand, an organization such as IALA might decide that all of their publications would follow another format where the category of the publication is included in the identifier.

For example, a recommendation could be

*urn:mrn:iala:publications:recommendation:e-nav-140*

while the identifier of a guideline might be written such as

*urn:mrn:iala:publications:guideline:synchronisation-of-lights-1069*

As can be seen from the previous example the type specific part can be split into multiple hierarchies. It is all up to the governing organization how they want to structure their identifiers.

Another example of identifiers with multiple hierarchies could be an identifier scheme for lights and buoys. Here IALA could choose to let the type specific part consist of <CountryCode>:<National Identifier>. For example

*urn:mrn:iala:aton:us:1234X5*

There are no requirements that the governing organizations are permanent entities. For example, the European Mona Lisa project might choose to use “monalisaproject” as the governing organization. So, for example, a route id in this project might look like

*urn:mrn:monalisaproject:route-id:XCUS231230*

Internally in the project they would just use XCUS231230 to refer to a route. But when working with external systems or other projects the full name of the route would be used “urn:mrn:monalisaproject:route-id:XCUS231230”. In case other projects used another type of identifier for a particular route.

As can be seen from all these examples. The scheme is highly adaptable. Each organization can choose their own layout for a specific type of identifiers. It is easy to fit existing identifiers into the naming scheme. And it provides good context information about the type of the identifier in comparison to something simple like a random UUID.

## MRN Guidelines

While in general governing organizations will be free to structure their namespace in any way they see fit.  It would make sense to create some general guidelines. For example, that every organization should use "organization\_name:publications" for their publications.

Or that every identifier that refers to a country uses standards available in *ISO 3166 Codes for the representation of names of countries and their subdivisions.*

## Conclusion

In this paper we have suggested a naming scheme for identifying maritime resources on a global scale. The scheme is based on existing and well proven standards that are in daily use throughout the world. The identifier scheme is highly flexible and supports integration with identifiers that already exist in the maritime industry.

It is our belief that the introduction of such a naming scheme would be a very important step towards a better digitally connected maritime domain.

1. <http://tools.ietf.org/html/rfc3986> [↑](#footnote-ref-1)
2. A Uniform Resource Name Namespace for the EPCglobal Electronic Product Code (EPC) and Related Standards: http://tools.ietf.org/html/rfc5134, http://www.gs1.org/sites/default/files/docs/epc/TDS\_1\_8\_Standard\_20140203.pdf [↑](#footnote-ref-2)
3. A Uniform Resource Name (URN) Namespace for the International Organization for Standardization (ISO): http://tools.ietf.org/html/rfc5141 [↑](#footnote-ref-3)