IALA GUIDELINE

G1183
THE PROVISION OF MARITIME CONNECTIVITY PLATFORM (MCP) IDENTITIES

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10, rue des Gaudines - 78100 Saint Germain en Laye, France
Tel. +33 (0)1 34 51 70 01 - contact@iala.int
www.iala.int
International Organization for Marine Aids to Navigation

DOCUMENT REVISION

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

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June 2024	First Edition	Council 80
December 2024	Minor revision to Edition 1.1: • MRN syntax corrected • Clarification of certificate renewal • Added a figure on MRN syntax	Transition Council 3

CONTENTS

1. INTRODUCTION

1.1. SCOPE

The goal of this document is to define the requirements for providing and using secure identities by means of the Maritime Identity Registry (MIR) of the Maritime Connectivity Platform (MCP). It is, thus, intended both for organisations that are planning to become MCP Identity Service Providers and organisations that intend to make and run applications and services that use MIR certificates to implement secure identities. The IALA recommendation for such secure identities is stated in IALA R1019 on Provision of maritime services in the context of e-Navigation in the domain of IALA.

1.2. RATIONALE

The prerequisite for the digitalisation of the maritime domain is a trustworthy provision of digital services for information exchange. For example, when a vessel approaches a port or waters controlled by a Vessel Traffic Services (VTS) centre, it is dependent on receiving information from them. However, it is not only important to receive the respective information, but also to verify from whom the respective information was sent and who the service is provided by. Otherwise, arbitrary participants could, for example, deliberately send out false information in order to disrupt the processes. In this case the recipient would not be able to differentiate which information is the original and which is the falsified information. To solve this problem, the respective participants need to be able to authenticate each other securely. In the paper world, authentication is done by a handwritten signature of the authorised person. In the digital world this is done by using digital certificates and signatures.

The MCP features - as one of its core components - an identity registry, where all entities that wish to exchange information are registered and have a digital certificate issued to them. Thus, a vessel registered with the MCP identity registry (having a digital certificate issued from it), can authenticate itself (cryptographically prove its identity) to the VTS centre, and thus provide data to the VTS centre which the VTS centre can trust the origin of. The principle of authentication is a cornerstone in contemporary digital solutions.

2. SPECIFICATION

There are three aspects of MCP identity provisioning:

1. Identity Management: a MIR enables that each maritime entity (such as a device, human, organization, service, ship, etc.) can be registered as a participant of the MCP and be equipped with a unique identifier. The identifier is given in terms of an MRN (Maritime Resource Name [1]). While MIR governance harmonizes the MRN namespace governed by the MCP Consortium (MCC) and sets out criteria for the registration process, it is up to the MIR services to implement and have certified concrete identity registries. The following terminology:
    - MCP entity: an entity registered at some MIR services.
    - MCP namespace: the subspace of the MRN namespace that is governed by the MCC. See Section 4, Identity Management, for details.
2. Public Key Infrastructure (PKI): the MIR enables each MCP entity holds a cryptographic identity in terms of a public/private key pair and a certificate bound to their MRN identifier within the MCP. The cryptographic identity of a MCP entity will change over time (due to updates of key material), but the MRN identifier must be unchanged over this certificate change. See Section 5, Public Key Infrastructure, for details.
3. Federation between identity providers: for a distributed identity system to work a system must be in place that allows the federation of trust between identity providers at some level. This may mean attestation protocols or trust networks. This aspect will be defined in future versions.

3. THE ROLE OF THE MCP CONSORTIUM

The MCP Consortium (MCC) was established in 2019, with the aim to realise the MCP. The specifications of the MCP have later become IALA guidelines (including this document), except for the Maritime Messaging Service (MMS), which has become an RTCM standard, leaving the MCC with the following activities:

1. Maintain procedures for endorsing MCP service providers using this IALA guideline. The endorsement aims at checking compliance with the guideline, but in addition it includes a minimal vetting procedure for organisations for which identities are being provided. A document describing the endorsement procedure can be found on the web-page of the consortium.
2. Endorse MCP Identity Service Providers, that follow this Guideline.
3. Issue MCP MRN namespaces to MCP Identity Service Providers.
4. Maintain a (signed) list of root certificates of endorsed MCP identity service providers. This provides the means to identify MCP identities with some level of basic trust.

It is important to note that the MCC is not a legal entity, and therefore, from a legal perspective, all activities of the MCC are performed by its members. Information about MCC, its activities, relevant documents and access to the public demonstrator can be found at www.maritimeconnectivity.net.

4. IDENTITY MANAGEMENT

The MCP namespace is a subspace of the Maritime Resource Name (MRN) space [1], which is an official URN namespace. The syntax definitions below use the Augmented Backus-Naur Form as specified in [11].

4.1. THE MCP NAMESPACE

The syntax for an MRN is as follows [1]:

```
MRN     = "urn" ":" "mrn" ":" OID ":" OSS
          [ rq-components ]
          [ "#" f-component ]
OID     = (alphanum) 0*20(alphanum / "-") (alphanum)
OSS     = OSNID ":" OSNS
OSNID   = (alphanum) 0*32(alphanum / "-") (alphanum)
OSNS    = pchar *(pchar / "/")
```

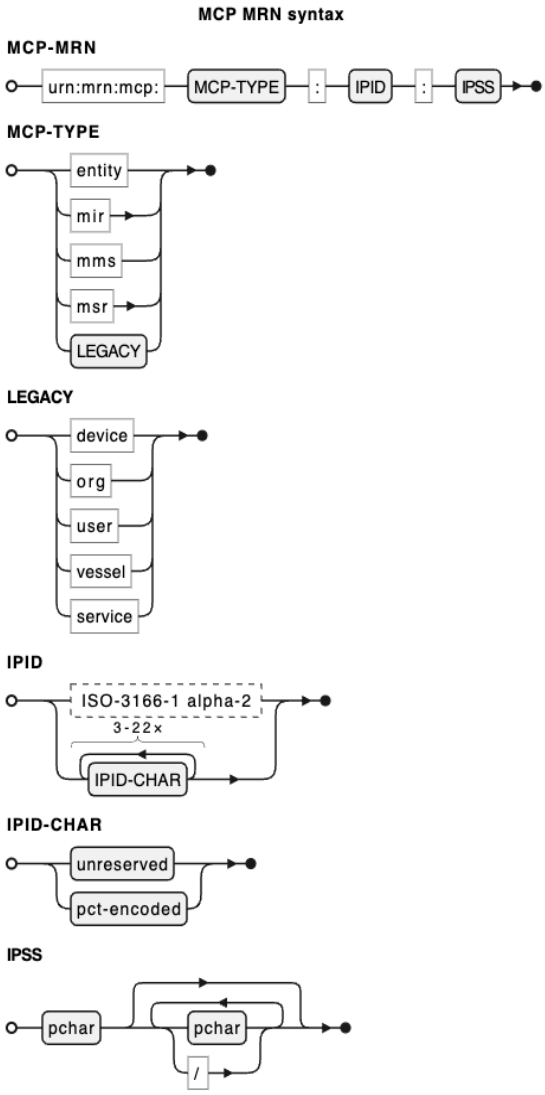
The rules for alphanum and pchar are defined in [10]. The optional rq-components and f-component are specified in [14].

The "mrn" specifies that the URN is within the MRN namespace. The Organization ID (OID) refers to an organization that is assigned a subspace of MRNs such as IMO, IALA, or the MCP. Syntactically, it is a string that must be unique across the "mrn" scheme. The Organization Specific String (OSS) is specified and managed by the governing organization in a consistent way conform to the definitions of the MRN namespace. In particular, each organization must structure the OSS into two parts: the Organization Specific Namespace ID (OSNID), and the Organization Specific Namespace String (OSNS). The OSNID identifies a particular type of resource (uniquely within the governing organization), while the OSNS identifies the particular resource (uniquely for its type within the governing organization). Altogether, this ensures that the resulting URN is globally unique.

For an MRN governed by the MCC the OID reads "mcp", and the OSNID specifies one of the following types used within the MCP: any, device, organization, user, vessel, service, MIR, MMS, and MSR. The latter three types are intended to be used for entities of the three MCP components: Maritime Identity Registry, Maritime Messaging Service, and Maritime Service Registry, respectively. Moreover, the definition of the OSNS takes into account the

distributed structure of the MCP: identities can be provided and managed by several Identity Service Providers. In detail, the syntax of a MRN governed by the MCC (short: MCP MRN or MCP name) is as follows:

```
MCP-MRN      = "urn" ":" "mrn" ":" "mcp" ":" MCP-TYPE ":" IPID ":" IPSS
MCP-TYPE     = "entity" / "mir" / "mms" / "msr" / LEGACY
LEGACY       = "device" / "org" / "user" / "vessel" / "service"
IPID         = <CountryCode> / 3*22IPIDCHAR
IPID-CHAR    = unreserved / pct-encoded
IPSS         = pchar *(pchar / "/")
```



The rules for unreserved and pct-encoded are defined in [10].

Each element of the MCP MRN is defined as follows:

- The "mcp" specifies that the governing organization is the MCC.
- MCP-TYPE. As mentioned above this specifies one of the types possibly used within the MCP. "mir", "msr" and "mms" are intended for internal MCP purposes. For other types, the "entity" type should be used. "device", "org", "user", "vessel" and "service" can be used to indicate identity types; however, these are not formally defined and is considered to be legacy. If an identity provider chose to use these, no specific information of the type should be assumed by other parties.
- The Identity Provider ID (IPID) refers to a national authority or other kind of organization that acts as an Identity Service Provider within the MCP. IPID country code as defined by ISO 3166-1 alpha-2 are reserved for national authorities that function as an Identity Service Provider. Otherwise, it will be a string of the same syntax as that for OIDs. The IPID must be unique across the urn:mrn:
- The MCP namespace.
- The Identity Provider Specific String (IPSS) can be defined and managed by the respective Identity Service Provider in a way that is consistent and conforms to the definitions of the MRN namespace and requirements laid down by the MCC. In particular, the Identity Service Provider must ensure that the IPSS identifies a particular resource uniquely for its type within the domain of the Identity Service Provider. Altogether, this will ensure that the resulting URN is globally unique.

Examples:

1. urn:mrn:mcp:entity:dma:alice – valid MCP MRN, where “dma” specifies the ID Provider, and the subsequent IPSS string is defined to give the username.
2. urn:mrn:mcp:entity:mirX:aton:gb:sco:6789-1 – valid MCP MRN for the same AtoN, where “mirX” specifies the ID Provider, and the subsequent IPSS string is defined to first specify the type of the device, and then to follow the country-specific convention of the IALA scheme.
3. urn:mrn:iala:aton:gb:sco:6789-1 – valid MRN for a marine aid to navigation (AtoN), where “gb” stands for United Kingdom, “sco” for Scotland, and the number is the Scottish asset identifier. The example is from [1]. This is not a MCP MRN.

The following requirements pin down that and how the MCP namespace can be managed decentral.

ID1 The MCC can delegate the assignment of part of the MCP namespace to other organizations that act as Identity Service Providers. More concretely, this means that the organization, say X, must hold an IPID, say string "nameofx", and is then responsible for the namespace with the prefix "urn:mrn:mcp:entity:nameofx".

ID1.1 The MCC must ensure that each IPID refers to at most one Identity Service Provider.

ID1.2 Each Identity Service Provider must ensure to respect all syntax prescribed in the MRN specification. Moreover, each Identity Service Provider must ensure that each IPSS of their name space refers to at most one entity of their domain.

Note that ID1.1 and the second part of ID1.2 together ensure uniqueness: one MCP MRN is assigned to at most one entity. This is a general requirement for any URN.

Example:

Say there are two ID providers, MIR X and MIR Y. Assume the MCC assigns the IPID "mirX" to MIR X, and "mirY" to MIR Y respectively. The MCC must ensure that the strings "mirX" and "miry" are not assigned to any other MIR. MIR X is responsible for the namespace "urn:mrn:mcp:<MCP-TYPE>:mirX:*", and MIR Y is responsible for the namespace "urn:mrn:mcp:<MCP-TYPE>:miry:*" respectively. They might decide to employ the same syntax for the IP specific string and make this part of a profile they both adhere to. Other ID providers are not bound to use the same syntax. However, if they do not comply to it they cannot be compliant to that profile.

4.2. FURTHER REQUIREMENTS FOR A STRONG NOTION OF MARITIME IDENTITY

The vision of the MCP is to enable a strong concept of digital maritime identity. Hence, the following requirements go beyond what is commonly required of URNs. Firstly, it is required that every MCP entity must have a name within the MCP namespace. This gives a clear concept of MCP entity: those entities that are registered under an MCP MRN name. Secondly, it is required that one MCP entity cannot have several MCP MRNs.

ID2.1 Each Identity Service Provider shall ensure that each entity they register holds exactly one MCP MRN within their namespace. This does not exclude that an MCP entity can hold other MRNs, but these must be within namespaces governed by other organizations (e.g. IMO). Also, there will be formulated exceptions concerning legacy MRNs within the MCP namespace.

Hence, the AtoN in the example above can be identified by its IALA MRN, or its MCP MRN respectively. However, Requirement ID2.1 rules out that the AtoN can be referred to by a second MCP MRN from the same identity provider.

ID2.2 Each MCP MRN registered at an MCP Identity Service Provider is to be interpreted as a distinct entity.

The rule for ID2.1 ensures that all identities at MCP Identity Service Providers holds an MCP MRN. ID2.2 states that different MCP MRNs are to be interpreted to be different entities; this is both at a specific and across multiple MCP Identity Service Providers. This means that information from the MIRs cannot be used to assume any relationship between MCP MRNs. The MIRs are only used to give unique identifiers (MCP MRNs) and associate certificates.

5. PUBLIC KEY INFRASTRUCTURE

In addition to a unique ID in the form of an MCP MRN each MCP entity is provided with a cryptographic identity. This consists of a public/private key pair and a certificate for the public key bound to their ID. In the following describe the concept of the PKI that enables this, and a first set of requirements for it. Also, issues are identified, that need to be addressed and refined in the future.

The following explain the MCP core concepts of cryptographic identity, detail the decentral PKI, specify the requirements on cryptographic keys and mechanisms, and the format of MCP certificates is described. Moreover, the section will show how a service can use an intermediary level of service certificates. For example, this is necessary if a service comes with cryptographic requirements that do not allow the direct use of the MCP ID credentials. Finally, further aspects to be considered are noted.

5.1 CRYPTOGRAPHIC IDENTITY

The cryptographic identity of an MCP entity consists of at least one public/private key pair and a certificate bound to an MRN. The certificate must be issued by the Identity Service Provider responsible for the entity. The latter is clearly defined by the IPID string within the MRN of the entity.

Given an entity with MRN A (short: entity A), and its Identity Service Provider P, the following notation it used:

- pk_A is the public key of A, and pr_A is the private key of A respectively:
- $cert_P(A, pk_A, V)$ is the certificate of A signed by its Identity Service Provider P. The certificate contains the MRN A, the public key of A, and the validity period V of the certificate. (The precise format is provided in Section 5.4).

The key pair is for use with a digital signature scheme. Hence, each MCP entity A can be verified by another party B to be the originator of a message or other data. As usual, this involves the following steps:

1. Entity A signs the message, say M, using its private key pr_A. The result is a cyphertext C.
2. Entity A makes available its certificate $cert_P(A, pk_A, V)$, and transmits the signed message (M concatenated with C).
3. Entity B obtains the certificate and receives the signed message.
4. Entity B validates the certificate. As a result, B trusts that pk_A is the valid public key of the MCP entity with MRN A. (Necessary requirements on certificate validation will be specified.).
5. Entity B uses pk_A to verify whether the ciphertext C is indeed the digital signature of M. If the verification is successful, then B has assurance that M indeed originates from A. (Note that without the fourth step B only has assurance that M originates from the holder of the private key counterpart of pk_A.)

Note that B does not necessarily need to be an MCP entity.

At the time of writing the MCC does not prescribe a policy on how to use ID credentials. They could be used as long-term credentials to obtain short-term credentials for use for a service, or they could be directly used as working credentials.

5.2 DECENTRAL PKI

One of the principles of the MCP is to make do without a global notion of trust: in the international context of the MCP, it cannot be expected that all parties trust each other and each other's security management uniformly. Rather the goal of the MCP is to provide the transparency that enables organizations to decide on whom to trust in which context, and to provide the technical framework to translate such decisions into executable policies. This motivates the following requirements:

PKI1.1 (PKI Structure) There shall be no root CA at the top level of the MCC. Every Identity Service Provider that hosts a PKI instance is to provide their own root CA.

PKI1.2 (Validation of IPID) When a receiving party verifies a MCP certificate, say $cert_P(A, pk_A, V)$, it must verify that the certificate is indeed signed by the Identity Service Provider responsible for A. The Identity Service Provider responsible for A can be read by the receiving party from the IPID string within the MRN A.

For example: For the vessel with MCP MRN urn:mrn:mcp:entity:duckville:scrooge-lines:dollar1 the identity service provider is found with the IPID duckville and the responsible MIR has the MRN

urn:mrn:mcp:mir:duckville. The identity service provider for duckville must also have an entity MRN, i.e. urn:mrn:mcp:entity:duckville.

The following requirements ensure that information on root certificates and security levels are made publicly available.

PKI1.3 Every Identity Service Provider is to publish their currently valid root certificate in a suitable fashion. For example, this can be made accessible via their web page, or they can commission a generally accepted authority or assurer to do so.

PKI1.4 Every Identity Service Provider must publish the Certificate Policy, and Certification Practice Statement detailing the actual operation of the MIR service. The Certificate Policy and Certification Practice Statement must follow best practice and include the Basic Requirement with implementation details where relevant.

PKI1.5 Every Identity Service Provider is to generate and publish a root certificate revocation list (CRL) containing any revoked issuing Cas. All active issuing Cas must include an endpoint to the root CRL.

PKI1.6 Every Identity Service Provider is to generate and publish CRLs containing any revoked MCP ID certificates for each of its issuing CA's.

PKI1.7 Every Identity Service Provider is to support and provide an endpoint for an online certificate status protocol (OCSP) responder [RFC6960].

From this the MCC will provide a secure way to automatically find and give basic trust in the authenticity of the MCP Identity Service Providers.

PKI1.8 The MCC will publish one current and valid root certificate that is used to authenticate (sign) each Identity Service Provider certificate.

PKI1.9 The MCC will provide a list of Identity Service Providers, links to obtain their root certificates, security levels, and signatures of certificates signed with the given root certificate. Including a revocation list.

PKI1.10 Each Root Certificate is assigned to the Identity Service Provider entity MRN (e.g. urn:mrn:mcp:entity:duckville) and the intermediate certificate used to sign entity certificates is assigned to the respective MIR (i.e. urn:mrn:mcp:mir:duckville).

PKI1.11 The entity with a Root Certificate must also have a client certificate for normal certificate usage. Root Certificates must only be used for signing of MIR intermediate certificates.

PKI1.12 The Intermediate Certificate of a MIR must only be used to sign client certificates. The MIR must use another certificate for other usage.

The MCC board will manage this root certificate, and detail guidelines and rules for its operation; this includes the Certificate Policy and Certification Practice Statement. These rules should follow best practice and will be published on the MCC website. This will also include location of valid certificates, signed certificates, and revocation lists. There will also be example code on how to interact with this. The management can be delegated by the board to a specific host member.

Note, that this does not break with the above claim that the MCC will not work as a root CA. This certificate is intended to only give a basic knowledge, meaning that the authenticated MCP instances are endorsed by the MCC and, to the best of MCCs knowledge, are operating within rules and guidelines as defined by this document. As stated earlier, full trust can only be established between each organisation and if deeper trust is needed, other PKI systems or external certification organisations is required.

5.2.1. SECURITY REQUIREMENTS AND PROFILES

Security requirements to be defined will fall into the following categories:

1. Requirements on vetting. This can be specified similarly to classes such as EV (extended validation).

2. Requirements on certificate revocation.
3. Requirements on the validity period of certificates.
4. Requirements on security of keys and origin of signing – CA side (including requirements on Hardware Security Modules (HSMs)).
5. Requirements on security of keys and origin of signing – MCP entity side (including requirements on HSMs).

The requirements will be dependent on the currently emerging profiles:

- MCP entities generate their ID key pair themselves and in own responsibility and provide this to the responsible CA for certification.
- The CA (perhaps together with a manufacturer) provisions the initial ID key pair and certificate securely within HSMs (for/within endpoints) to be distributed to the MCP entities.

5.3 CRYPTOGRAPHIC REQUIREMENTS

The cryptographic mechanism approved for ID digital signatures is the Elliptic Curve Digital Signature Algorithm (ECDSA) [6] with the appropriate hash algorithm from the SHA-2 family [5]. The approved elliptic curve domain parameters are specified by reference to standardized curves. Currently the following combinations are approved[1]:

ECDSA Key Size (bits)	Hash Algorithm	Elliptic Curve Domain Parameters
384	SHA-384	P-384 [FIPS 186-3] (= secp384r1)
256	SHA-256	P-256 [FIPS 186-3] (= secp256r1)

Future extensions:

- Requirements on key pair generation and checks for key pair validity will be given by reference to standards. Also, it is needed to check whether there are relevant recommendations in the last version [7].
- Currently the only approved curve parameters are the NIST recommended curves. It will be checked whether this needs to be extended with regards to cryptographic recommendations of other IALA guidelines (e.g., BSI and brainpool curves). Also, if a curve is found to be weak in the future it will be good to have an alternative curve per key size already approved.
- We will also consider matters of crypto agility.

5.4 CERTIFICATE FORMAT

The format of the MCP ID certificates is as follows. The format is based on the X.509 standard [12]. The standard information present in an X.509 certificate includes:

- Version – which X.509 version applies to the certificate (which indicates what data the certificate must include).
- Serial number – a unique assigned serial number that distinguishes it from other certificates.
- Algorithm information – the algorithm used to sign the certificate.
- Issuer distinguished name – the name of the entity issuing the certificate (MCP).
- Validity period of the certificate – start/end date and time.
- Subject distinguished name – the name of the identity the certificate is issued to.

1 The 256 ECDSA key size (in combination with the SHA-254 hash algorithm) should only be used in environments with significant bandwidth restrictions, where the length of the generated signatures cannot exceed 64 bytes. A use case could be ensuring backwards-compatibility of the MCP with existing AIS data transmissions.

- Subject public key information – the public key associated with the identity.

The subject distinguished name field should consist of at least one of the following items:

Table 1: Subject distinguished names fields

Field	User	Vessel	Device	Service	AtoN	Organization
MCP-TYPE	"entity"	"entity"	"entity"	"entity"	"entity"	"entity"
CN (CommonName)	Full name	Vessel name	Device name	Service Domain Name	AtoN name	Organization Name
O (Organization)	Organisation MRN					
E (Email)	User email					Organization email
C (Country)	Organization country code					
UID	Entity MRN					

Example: The following gives an example of the Subject distinguished name field for a vessel with Identity Service Provider idp1:

C=DK, O=urn:mrn:mcp:entity:dk, CN=Ship Name, UID=urn:mrn:mcp:entity:dk:shipname

In addition to the information stored in the standard X.509 attributes listed above, the X509v3 extension SubjectAlternativeName (SAN) extension is used to store extra information. There already exists some predefined fields for the SAN extension, but they do not match the need there is for maritime related fields. Therefore the "otherName" field is used, which allows for using an Object Identifier (OID) to define custom fields. The OIDs currently used are not registered at ITU but are randomly generated using a tool provided by ITU (see http://www.itu.int/en/ITU-T/asn1/Pages/UUID/uuids.aspx). See the table below for the suggested fields defined, the OIDs of the fields, and which kind of entities that use the fields.

Table 2 Suggested defined fields and their usage by entity kinds

Field	OID	Used by
Flagstate	2.25.323100633285601570573910217875371967771	Vessels, Services
Callsign	2.25.208070283325144527098121348946972755227	Vessels, Services
IMO number	2.25.291283622413876360871493815653100799259	Vessels, Services
MMSI number	2.25.328433707816814908768060331477217690907	Vessels, Services
AIS shiptype	2.25.107857171638679641902842130101018412315	Vessels, Services
Port of register	2.25.285632790821948647314354670918887798603	Vessels, Services

Ship MRN	2.25.268095117363717005222833833642941669792	Services
MRN	2.25.271477598449775373676560215839310464283	Vessels, Users, Devices, Services
Permissions	2.25.174437629172304915481663724171734402331	Vessels, Users, Devices, Services
Alternate MRN	2.25.133833610339604538603087183843785923701	Vessels, Users, Devices, Services
URL	2.25.245076023612240385163414144226581328607	

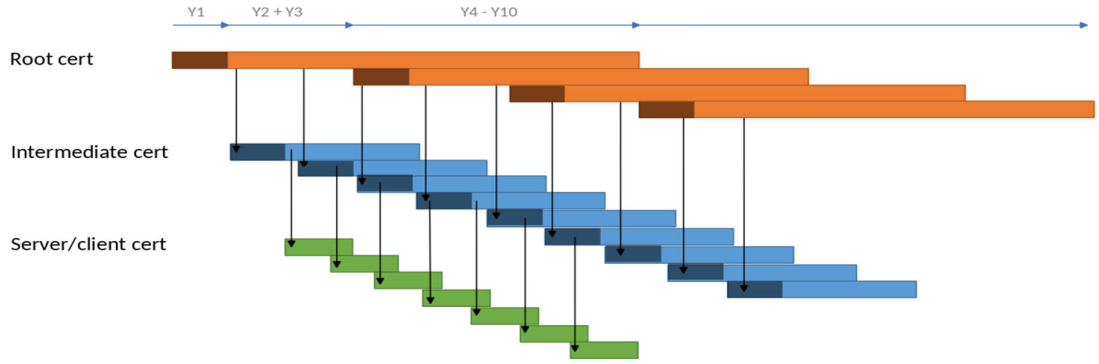
Encoding of string values in certificates must follow the specifications defined in RFC 5280 [12], and where possible it is highly recommended to use UTF-8.

To be able to check the revocation status of a given certificate, all MCP ID certificates must include an endpoint to an up-to-date certificate revocation list that is signed by the issuing CA that has signed the certificate in question according to RFC 5280 [12].

Additionally, all MCP ID certificates must also include an endpoint to an OCSP responder that is able to return the revocation status of the certificate in question, according to RFC 6960 [13].

5.5 RECOMMENDATIONS FOR THE VALIDITY PERIOD OF THE CERTIFICATE

The following defines the recommended validity period of certificates. The validity period defines the maximum length of a certificate; it does not include any information about revocation. Therefore, the associated revocation list must always be checked in combination with the validity period. For different entities/levels in a certificate hierarchy, different validity periods are appropriate. At the highest level, root certificates should have a longer validity that overlaps with periodically newly added root certificates. At the intermediate level(s) the validity



period should be shorter, but still long enough to allow distribution before they can be actively used.

Figure 1 Certificate renewal strategy

For certificate validity periods in a root-intermediate-client hierarchy are recommended to be:

- MCP Identity Service Provider Root Certificate: they should behave as Root-CA: 10 years validity and renewed every 3 years, certificate should only be used for signing when at least 1 year old.
- MCP Identity Service Provider Intermediate Certificate: 3 years validity, renew every 1 year, certificate should only be used for signing when at least 1 year old.

- End-system or client certificate (signed by intermediate): 6 months validity, renew 2 months before expiry.

This defines a rolling certification renewal that is ensures that the validity period of lower-tier key (signed by root or intermediate certificates) will always be valid throughout the validity period. When renewing a certificate, it is recommended to always renew keys as well as signing requests [8].

When creating a certificate, one could also choose a postponed validity starting date to cover the starting period for distribution before active use. In the graphic to the right, the above scheme is depicted.

It is suggested to standardise all periods and have specified periods for the root, the intermediate (MCP instance, issuer) and the end user, whether client or server.

Keys and certificates must be archived and/or deleted according to the guidelines specified in reference [8].

It is important to note that these recommendations do not supersede requirements defined by other governing documents, e.g. [2], [3].

5.6 CERTIFICATE RENEWAL

All Identity Service Providers and their MIR implementations must allow automatic renewal of certificates using an open protocol, e.g. according to [15].

All device and software suppliers that use MCP identities must allow the automated renewal of certificates without the need for manual maintenance activities.

All device and software suppliers must allow the purchaser to use their own certificates and define the MIR instance that is used to automatically renew the certificates.

5.7 SERVICE CERTIFICATES

Several maritime services come with requirements concerning cryptography and/or certificate formats that might make it impossible to employ MCP ID credentials directly. For example, if an Identity Service Provider issues certificates for ECDSA with 384 bits key size this will not meet the real-time requirements and low bandwidth conditions of AIS and VDES [4]. While the service must then provide its own CA the service CA can automatically issue its service certificates based on MCP ID credentials. There is provided an example of how this can be done based on the concept of certificate signing requests (CSRs), also known as certification requests. The most common format for CSRs is defined by the PKCS#10 standard [9].

Example: The following example show the steps carried out by an MCP entity to request a service certificate, and the steps performed by the service CA to issue the certificate respectively. The example follows the implementation of the Haptik CA from the project Haptik (https://haptik.io).

The MCP entity:

1. generates a fresh key pair for use with the service;
2. builds a X.500 name for use in the service certificate;
3. builds a corresponding PKCS#10 CSR;
4. signs the CSR with their private MCP ID key; and
5. sends the CSR together with their MCP ID certificate to the service CA.

On receipt the service CA:

1. checks whether the CSR is valid;
2. builds a X.509v3 certificate according to the CSR and additional information provided by the CA such as issuer, serial number, and validity period;
3. signs this with their CA private key; and

4. sends the new certificate to the requesting MCP party.

Note: This pattern is also applicable when the MCP ID keys are mainly used as enrolment keys to obtain shorter lived "working keys".

5.8 OBTAINING THE CERTIFICATE OF AN MCP ENTITY

An MCP Identity Service Provider must provide an interface that can be used by an actor to get either a specific certificate based on its serial number or cryptographic thumbprint or any active certificates of an MCP entity with a given MCP MRN.

This interface must follow the GetPublicKey service interface specification described in Section 8.6.3 of IEC 63173-2 (SECOM) [4] with the modification that when providing an MRN as the input parameter, the multiplicity of the return value must be 0..* instead of 0..1, effectively meaning that the interface can return zero or more certificates for an entity with a given MRN.

6. DEFINITIONS

The definitions of terms used in this Guideline can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary should be considered as the authoritative source of definitions used in IALA documents.

7. ACRONYMS

ECDSA	Elliptic Curve Digital Signature Algorithm
HSMs	Hardware Security Modules
IPID	Identity Provider ID
IPSS	Identity Provider Specific String
MCP	Maritime Connectivity Platform
MCC	Maritime Connectivity Platform Consortium
MIR	Maritime Identity Registry
MMS	Maritime Messaging Service
MRN	Maritime Resource Name
OCSP	Online Certificate Status Protocol
OID	Organization Identity Document
OSNID	Organization Specific Namespace ID
OSNS	Organization Specific Namespace String
OSS	Organization Specific String
PKI	Public Key Infrastructure
RTCM	Radio Technical Commission for Maritime Services
URN	Uniform Resource Name
VTS	Vessel Traffic Services

8. REFERENCES

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[4] IEC. IEC 63173-2:2022 Standard, Maritime navigation and radiocommunication equipment and systems – Data interfaces – Part 2: Secure communication between ship and shore (SECOM)

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