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| IALA Guideline |

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maritime service registry (MSR) Technical Specification

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# Introduction

## scope

The goal of this document is to define the requirements for implementing a Maritime Service Registry (MSR) that is a part of the Maritime Connectivity Platform (MCP). It is intended primarily for organizations that are interested in implementing their own MSR and providing a MSR to allow for service registration and discovery; and secondarily to organizations implementing software systems that make use of a MSR to

1. Register their own service in an MSR and update its information as necessary, and/or
2. Find instances of services that fulfil the needs of the system user.

The requirement for maritime service registries is based on the IALA guideline G1128 and SECOM (TODO references).

## RATIONALE

In IMO resolution MSC.467(101) ‘guidance on the definition and harmonization of the format and structure of maritime services in the context of e-navigation’, IMO defines Maritime Services and Technical Services in the context of e-navigation. In the resolution the Maritime Services are on the highest level, describing a service in an entirely non-technical manner. One or more Technical Services are associated with a Maritime Service, and these Technical Services are the ones defining the actual information exchange needed to take place to implement a Maritime Service.

Maritime Service Registry, MSR for short, is a registry of the implementations of Technical Services and is a reference point to information on registered services and offers discoverability for the registered services. It can be seen as a sophisticated yellow pages phone book. A registry can be searched using several different criteria including coverage area. MSRs conforming to these requirements will be able to federate searches to the global network of MSRs to allow service discovery over a wider network. The MSR is one of the core components of the MCP.

The Technical Services in the resolution are also defined on three levels following the same structure as G1128, where MSR supervises all service providers to describe their service in the format of G1128.

## Purpose

The main tasks of MSR are registration of services by service provider and a discovery service for registered services, so any service consumer can identify available services and find the endpoint of the service. MSR registration needs to be able to register all relevant e-Navigation and e-Maritime services, commercial and non-commercial, authorized and non-authorized, for free and against payment. Each provider of a MSR has their own criteria for acceptance of services to be listed. This guideline does not impose requirements on providers on their criteria. MSR needs to allow service consumers to discover available services and enable the use of the services through given endpoints. To allow for service discovery by clients without the hardcoded knowledge of all existing MSRs the service registries have a mechanism for implementing a global search that will delegate a search for services to all of the MSRs in the network.

MSR is an implementation of service management concept which was given in the IALA's G1128 specification.

A diagram of a service

Description automatically generated

1. Service management concept as defined in G1128

TODO insert description of diagram above

## Intended readership

This service specification is primarily intended to be read by architects, system engineers and developers in charge of developing and operating a MSR instance. Furthermore, this service specification is intended to be read by enterprise architects, service architects, information architects, system engineers and developers in pursuing architecting, design and development activities of related maritime services and consumer applications of these services.

## Inputs from other sources

The service management concept from IALA's G1128 specification was given and implemented throughout previous projects such as EfficienSea2 and Sea Traffic Management. The experiences from these projects have also influenced the service discovery interface defined in SECOM (TODO reference) that has been adapted as a basis for the specification of the interface in this document.

## Conventions

The terms MUST, MUST NOT, SHOULD, SHOULD NOT, MAY follow the definitions and usage defined in RFC 2119 TODO Ref.

Consumer is used to define any consumer that is calling the MSR via an API to execute a search.

# Use CASES for maritime service registries

To understand the rationale behind the design choices that have guided the development of the requirements listed in this guideline, the primary use cases of maritime service registries must be outlined and understood. The following use cases have served as the basis for the decisions made and are based on the experiences of previous projects and knowledge of ongoing efforts in defining and implementing Maritime Services. These use cases are not a comprehensive list but are identified as the most important use cases that have been identified.

In terms of and MRN space, the **MCP domain** is defined as the prefix that is used in all MRNs issued by that MCP provider. For example, in the MRN urn:mrn:mcp:entity:duckville:donald-duck the prefix urn:mrn:mcp:entity is a required constant part of each MCP MRN and the string duckville identifies the domain. The MCP domain corresponds to the IPID string defined in section 4.1 of G1183 TODO ref. In this context the MCP domain is defined as all the components, services, users etc included in a single MCP instance with an MRN starting with the same prefix.

To reduce unnecessary duplication the following actor definitions will be used in the following use cases:

* **User** the human using the consumer information system
* **Consumer**  (ship, shore based or other) information system
* **Maritime service registry** (MSR) of the consumer's MCP domain
* **Maritime identity registry** (MIR) of the consumer’s MCP domain
* Global MCP Search Platform communicates between multiple MCP domains
* MSR Service from other MCP domains
* **Maritime technical services** (such as for Navigational Warnings, AtoN information) in multiple MCP domains
* The **maritime service provider** (MSP) providing maritime technical service

The following diagram shows a high-level view of the general use cases in the MCP domain. The use cases are described in more detail below.

A diagram of a network

Description automatically generated

1. High-level use cases of MSR

Sections should be typed continuously, and generally page breaks or section breaks should not be entered between main sections. It may be necessary sometimes to insert a page break to allow for aesthetic layout e.g., not breaking a list over two pages.

## Use Case 1: Local Search

* **Who:** An consumer registered with a legitimate MCP instance
* **Wants to:** perform a search for a service located in the same MCP domain
* **So that:** obtain information required for planning a route.

### Description

An consumer is a registered user of a legitimate MCP instance. They intend to make a trip towards destination and will need to obtain information required for planning a route e.g. navigational warnings or AtoN information. To find the appropriate services that can provide that information, the consumer performs a search query to their respective MSR submitting as query parameters their

* route path or other geometry,
* the service design MRN (see G1128 TODO ref) and version which are compatible with their onboard equipment, and
* status is Released,

For example searching for Traffic Clearance Using SECOM would use the MRN urn:mrn:iala:techsvc:sd:vts:tcs:secom:1.x in the designId parameter where the prefix without the version number defines the technical service design and the version number suffix is used to pass a semantic version that is supported (see <https://docs.npmjs.com/about-semantic-versioning#using-semantic-versioning-to-specify-update-types-your-package-can-accept>) to define allowed versions. Thus the version number 1.x would search for all services that implement version 1.0 or higher but less than 2.0 of the design.

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### Actors

* Consumer (ECDIS, Route-Planning System or human mariner)
* MSR of the consumer's MCP domain
* Maritime Technical Service (such as for Navigational Warnings, AtoN information)

### Frequency of Use

Typically triggered when the consumer is planning for a trip in proximity to their base of operations.

### Pre-Conditions

* The consumer is registered with a legitimate MCP instance.
* The consumer's MCP instance already includes in its domain at least one service that meets the consumer's requirements.
* The consumer maintains connectivity throughout the whole operation.
* All actors support the SECOM searchService interface.

### Ordinary Sequence

1. User sends a search request to the MSR specifying that this is a local search only, including its route path and other criteria. A callback URL must not be provided as this identifies that the search is a local search only.
2. The consumer's MSR searches its internal database and responds directly to the consumer with a list of the currently registered services that meet the provided criteria. A transactionId is provided in the response to facilitate audit logging but end user must not expect any further responses.
3. The consumer will receive the service information list, which includes the endpoint information.
4. The consumer will make a selection on which of the services it will contact.
5. The consumer will contact the selected maritime information service.
6. The data is rendered and displayed to the user.

### Post-Conditions

The correct maritime information is received by the consumer.

## Use Case 2 – Global search

* **Who:** Consumer: any maritime information system
* **Wants to:** perform a search for a service
* **So that:** obtain information required for planning a route.

### Description

The user of the information system intends to make a trip towards a destination and will need maritime information (such as Navigational Warnings, AtoN information) regarding their pre-selected route. To find the appropriate services that can provide that information, the consumer performs a search query to their respective MSR with the same parameters as specified in use case 1.

The user should not need to select whether a local or global search is performed and the information systems used should perform a global search if required by the nature of the trip and available information in the local MSR.

### Actors

* User using the consumer information system
* Consumer (ECDIS, Route-Planning System or other information system)
* MSR of the consumer's MCP domain
* Global MCP Search Platform
* MSR Service from other MSR Service Provider
* Maritime Technical Service (such as for Navigational Warnings, AtoN information) in different MCP domain

### Frequency of Use

Typically triggered when the consumer is planning for a trip far away from their base of operations.

### Pre-Conditions

* The consumer is registered with a legitimate MCP instance.
* The consumer's MCP instance is interconnected with a compatible instance that does include in its domain a service that meets the consumer's requirements.
* All actors support the SECOM searchService interface.
* The consumer of the search has the ability to poll the MSR for further results.

### Ordinary Sequence

1. User sends a search request to the MSR, including its route path and other criteria including a parameter specifying the callback URL.
2. The consumer's MSR searches its internal database and finds a matching registered entry.
3. The consumer's MSR will reply with the local search result and supply a transactionId that is used when returning results from the other MSRs
4. The consumer's MSR propagates the search request (along with the geometry provided description of the route) to the Global MCP Search Platform.
5. The Global MCP Search Platform will forward the search for other interconnected MSRs, which might have services that meet the requirements specified in the received request. The forwarded search must include the transactionId returned to the end user and must strip the callback URL of the end user.
6. The other MSRs will respond with the search results from their internal databases. If a search via the search platform does not produce any results the other MSRs should not respond with an empty result. The response must include the transactionId.
7. The consumer's MSR will collect all valid responses identified by the transactionId and compile a single list of search response entries.
8. The consumer will receive the service information list by polling the MSR to get the results as they arrive via global search. If no results are received, an empty list is returned.
9. The consumer will select which of the services it will contact.
10. The consumer will contact the selected maritime technical service.
11. The data is rendered and displayed to the user.

#### Note on returned data

The interface will return the service data by default as a subset of the full list of instance metadata defined in G1128 in JSON format as specified by SECOM. However, if the includeXML-parameter is passed as true the return JSON will also include the full G1128 of the instance.

By default, not certificate information is returned. However, depending on search parameters, either the thumbprints of full certificate chains or the full certificate chains may be returned.

### Post-Conditions

The correct maritime information is received by the consumer.

## Use Case 3: Global Maritime Search Platform (GMSP)

* **Who:** An MSR that has received a global search from an end user
* **Wants to:** forward the search to other MSRs
* **So that:** they can return a list of available services that fulfill the search criteria.

### Description

A MSR receives a search from an end user that must be forwarded to other MSRs to perform a global search. The search is defined in use case 1 and the actual search parameters with the exception of the geometry are not of interest from the perspective of this use case.

### Actors

* Consumer (ECDIS, Route-Planning System or human mariner)
* MSR Service of the consumer's MCP domain MSR
* The MMS network providing the GMSP
* Other MSRs participating in the GMSP (MSRa, MSRb, ...)

### Frequency of Use

Triggered whenever a user executes a global search against any compliant MSR.

### Pre-Conditions

* The MSR is a participant in the GMSP
* The MSR knows the subjects defined in the GMSP
* The MSR maintains connectivity throughout the whole operation.
* All actors support the GMSP.

### Ordinary Sequence

1. The MSR receives a search from the consumer.
2. The MSR generates a transactionId which is a UUID-v4
3. The MSR executes the search against its own database and returns the result including the generated transactionId
4. The MSR uses its internal mapping of the GMSP subject list to define which subjects the search needs to be published to according to the geometry of the search. For sake of example, the subjects applicable to the search are subjectA and subjectB.
5. The MSR strips the search of the callback URL and adds the transactionId to the search that is published in all of the relevant subjects in GMSP (subjectA, subjectB).
6. The MSR subscribes to the subject identified by the transactionId
7. MSRa is subscribed to subjectA; MSRb to subjectC; and MSRc to subjectB and subjectA, and MSRd to subjectB. MSRb does not see the search and does nothing.
8. MSRa executes the search in its own database and publishes a message in the subject defined by the transactionId.
9. MSRc executes the search in its own database and publishes a message in the subject defined by the transactionId.
10. MSRd executes the search in its own database and gets no result and thus does not respond in any way.
11. The MSR collates the responses from both MSRa and MSRc and returns the collated information in the subsequent requests from the consumer that are identified with the transactionId.

### Post-Conditions

The correct list of services is received by the consumer.

## Use Case 4: Server Implementation of Global Search

* **Who:** Consumer: any MSR instance
* **Wants to:** perform a global search for a service
* **So that:** they can return search results from other MSRs

### Description

A MSR instance has received a search for a service that needs to be delegated to the global search platform in order to return results from multiple MSRs.

There are several variations of this use case depending on the search parameters and the requirements of individual MCP domains.

1. Search with geometry
2. Search without geometry
3. MSR requiring authentication to return results with or without geometry

All three of these variations will be described as subsets of the same use case.

All other search parameters are irrelevant from the perspective of this use case.

These three variants are suitable for use cases 1 and 2, but have been left out of those descriptions for simplicity and are described here where the use case is more technical in nature.

### Actors

* A consumer that executes a global search on MSR A
* The MSR that the consumer is using to perform the search (MSR A in following descriptions)
* MMS network providing the global search platform. This is separate from the default MMS network and access is restricted to vetted MSRs
* MSRs responding to a search received via the MMS network (MSR X, Y and Z in the following descriptions)

### Frequency of Use

Triggered every time a global search is executed.

### Pre-Conditions for all variations

* MSR receives a global search from a consumer
* Multiple MSRs are a part of the MMS network providing the global search platform

#### Additional pre-Condition for variation 3

* The consumer has provided a certificate proving its identity.

### Ordinary Sequence

1. A consumer sends a search to MSR A
2. MSR A checks for the existence of a certificate in the incoming request depending on MCP domain requirements
   1. The certificate is ignored and no validity is checked
   2. The certificate is ignored and no validity is checked
   3. If MSR A limits its use and requires authentication it will check the validity of the incoming certificate at this point. If certificate is invalid, the MSR will return an error to the consumer.
3. MSR A decides if authentication is required e.g. based on the search parameters
4. If authentication and authorization is required, authentication is done. If the consumer is not authenticated or authorized the next step will not be executed. The global search must still be executed.
5. MSR A executes the search in its local database
6. MSR A generates a transactionId for the search
7. MSR A returns the local search result and the transactionId to allow consumer to track incoming results to this search.
8. MSR A selects the MMS subjects that the search will be published to
   1. Without a geometry the search is published to the global MMS search subject that all participating MSRs must be listening to
   2. The geometry is mapped to the predefined set of search subject based on geometry and those subjects that cover the area in the geometry are used to publish the search to
   3. As above depending on the search parameters
9. The forwarded search will include the provided certificate that will be forwarded to all participants. The generated transactionId is also appended to the search parameters to allow collation of search results.
10. The MMS network pushes the search in all valid topics to all listening MSRs
11. Depending on variation
    1. All MSRs X, Y and Z receive the search
    2. Only MSRs X and Z receive the search as they are the only ones interested in the defined search subjects
    3. As above depending on search parameters
12. If any of the participating MSRs requires authentication, the authentication is performed. If the consumer is not authenticated no results are returned and no error is returned.
13. All MSRs that received the search will execute it in their local database.
14. The results of the search will be returned via API call from MSRs X, Y and Z to MSR A
15. MSR A will collate the results returned and return them to the consumer in subsequent call to the search that are identified with the transactionId of the search.
16. After a predefined timeout MSR A may begin to ignore any further responses to the search.

#### Note on returned data

The interface will return the service data by default as a subset of the full list of instance metadata defined in G1128 in JSON format as specified by SECOM. However, if the includeXML parameter is passed as true the return JSON will also include the full G1128 of the instance.

The certificates of the services are not returned.

### Post-Conditions

The correct maritime information is received by the consumer.

## Use Case 5: Validate identity

* **Who:** An MSR
* **Wants to:** Validate the identity of an consumer (service, ship system etc)
* **So that:** It can authenticate the source of request and decide if the requested action is authorized

### Description

A MSR has received a request (search, update etc) and it wants to validate the identity of the consumer sending the request. Note that depending on the request this use case is either mandatory or optional.

### Actors

* Consumer that is the source of the request
* A MSR that receives the request
* A MIR that has provided the identity of the consumer

### Frequency of Use

Frequent – at most every time a MSR receives a request but may be less.

### Pre-Conditions for all variations

* Consumer provides a certificate in the request
* Consumer has made a request to the MSR

### Ordinary Sequence

1. Consumer makes a request to the MSR
2. The MSR validates the certificate and signature of the request by following the procedure described in section 5 of G1183 (TODO reference). MSR may contact the issuing MIR for extra verification if desired.
3. The MSR decides how to respond based on the results of the identity of the consumer.

### Post-Conditions

The MSR has ensured that the identity provided is valid.

## Use Case 6: Register service

* **Who:** A maritime service provider who provides a maritime service
* **Wants to:** Register their service for listing in an MSR
* **So that:** The service is discoverable to consumers

### Description

A maritime service provider wants to register their new service in their MSR. By registering in this context we mean the process of ensuring all necessary information for the addition of a service to MSR is present before actually adding it to the MSR.

### Actors

* A maritime service provider
* A MSR provider

### Frequency of Use

Rare, only when new services need to be added to the MSR. However, if service consumers (mainly ship systems) need to be registered in a service registry for discovery, this use case and use case 7 variations will need significantly more resources.

### Pre-Conditions for all variations

The maritime service provider is already registered with the MSR provider and can obtain a valid identity for the service from the MIR.

### Ordinary Sequence

1. Service provider obtains an identity for the service instance from the MIR.
2. Service provider has created the instance XML document and has the public certificates of the available.
3. If the MCP provider provides a self-service portal that allows the service provider to add their service to the MSR, go directly to use case 7B
4. MCP provider has a documented process on the steps needed from a service provider to enable the addition of the service into the registry. The process depends on each provider and is not in the scope of this guideline.

### Post-Conditions

The MCP provider has enough information to add the service to the service registry and enable updating of service metadata according to all variants of use case 8.

## Use Case 7A: Add service to registry

* **Who:** An authorized user of MCP provider
* **Wants to:** Add a new service to MSR
* **So that:** The service is discoverable

### Description

The MCP provider does not provide a self-service method of authorized users to add new services to the registry. The addition of each new service must thus be done by the MCP provider based on information obtained in use case 6.

### Actors

* MCP provider personnel
* MSR of the MCP provider

### Frequency of Use

Rare, only when new services need to be added to the MSR.

### Pre-Conditions

MCP provider has all necessary information on the service available: current certificates and instance description XML according to G1128 TODO ref.

The service should be up and running before this use case is undertaken.

### Ordinary Sequence

1. MCP provider personnel accesses internal tools to add new service to registry with the instance description and valid certificate
2. MSR validates the certificate
3. MSR validates the instance description
4. MSR test the polling interface of the service. If unsuccessful the service is marked as disabled and an error is shown to the user.
5. MSR verifies that the certificate provided during service addition matches the certificate provided by the service. If unsuccessful the service is marked as disabled and an error is shown to the user.
6. Instance is added to MSR and is immediately discoverable if it responded correctly to the tests above.
7. If the tests above fail, the MSR must provide a method for the user to be able to update information or force a retest. Once tests in steps 4 and 5 are successful, the service is marked as enabled and is discoverable.

### Post-Conditions

Service is listed in MSR and is discoverable.

## Use Case 7B: Add service to registry

* **Who:** An authorized user of the maritime service provider
* **Wants to:** Add a new service to MSR
* **So that:** The service is discoverable

### Description

The MSP uses the information collected in use case 6 to add the service to the registry in a self-service functionality (e.g. portal) offered by the MCP provider.

### Actors

* MSP
* MCP provider self-service service
* MSR

### Frequency of Use

Rare, only when new services need to be added to the MSR.

### Pre-Conditions

The MCP provider has provided a self-service portal that allows authorized users to add new services to the MSR. The generation and providing of the certificate for the service may be a part of the service addition or a separate step.

The user must have all of the information necessary for the instance description available.

### Ordinary Sequence

1. The service provider user accesses the self-service portal of the MCP provider.
2. The user begins the service addition
3. The user enters the instance description information
4. If the portal allows for the generation of service certificates during addition, the certificates will be generated and available for delivery to user. If generation of certificates is not allowed, the user must upload the public certificate of the service.
5. The process is paused until the service is up and running with the correct certificates.
6. The MSR will run the tests in steps 4 and 5 in use case 7A.
7. If all tests are successful, the service is marked as enabled and is discoverable. If not, user must take steps to correct issues and continue from step 6.

### Post-Conditions

Service is listed in MSR and is discoverable.

## Use Case 8A: Update service automatically

* **Who:** A maritime service
* **Wants to:** Update its metadata in the MSR
* **So that:** The service information is up to date

### Description

The maritime service must update its certificate information every time it has a new certificate issued. Also, during the deployment of new version of the service instance the metadata of the service may need updating. This includes, but is not limited to, the instance version number. At least the version number of the instance and the certificate must be updateable via automatic means.

### Actors

* The maritime service
* MSR

### Frequency of Use

At least once a month per service. Due to monthly certificate changes.

### Pre-Conditions

The service is registered and added to the MSR and has a valid certificate stored in the MSR.

### Ordinary Sequence

1. An action requiring the update of service metadata in MSR takes place, e.g. service receives a new certificate from MIR or is deployed with a new version.
2. Service generates an update request and signs it using a certificate the MSR has stored
3. Service obtains a one-time encryption key from the MSR
4. Service encrypts the update request and signature
5. Encryped message is sent to MSR
6. MSR decrypts the message
7. MSR verifies the update request against the certificate it has in store
8. MSR verifies that only changes that are allowed in the service information is present in the update request.
9. If update request is valid, MSR updates the service information.

### Post-Conditions

The service information in the MSR has been updated.

## Use Case 8B: Update service via self-service

* **Who:** A maritime service provider
* **Wants to:** Update the metadata of its service in the MSR via a self-service portal
* **So that:** The service information is up to date

### Description

Some of the metadata of the service may be outside the scope of what can be automatically updated by the service but allowed to be updated by the MSP in a self-service tool.

### Actors

* MSP
* MCP provider self-service tool
* MSR
* Optionally MCP provider personnel

### Frequency of Use

Depending on need but rare in most cases.

### Pre-Conditions

MCP provides a self-service method of updating service information for authorized users and MSP user has all necessary data available. The version number of the instance and certificate of the instance must be updateable automatically.

### Ordinary Sequence

1. An action requiring the update of service metadata in MSR takes place that cannot be done automatically either due to MCP provider policies or limitations in this guideline.
2. The necessary data is collected by MSP
3. MSP uses the self-service tool to update the information
4. If desired the MCP provider can review the changes before approval

### Service information is changed in MSRPost-Conditions

The service information in the MSR has been updated.

## Use Case 8C: Update service via MCP provider

* **Who:** A maritime service provider
* **Wants to:** Update the metadata of its service in the MSR by contacting the MCP provider
* **So that:** The service information is up to date

### Description

Some of the metadata of the service may be outside the scope of what can be automatically updated by the service or via an optional self-service tool by the MSP and requires a change by MCP provider.

### Actors

* MSP
* MCP provider
* MSR

### Frequency of Use

Depending on need but rare in most cases.

### Pre-Conditions

An update to service information is required that cannot be done automatically or through an optional self-service tool provided by the MCP provider to the MSP.

### Ordinary Sequence

1. An action requiring the update of service metadata in MSR takes place that cannot be done automatically either due to MCP provider policies or limitations in this guideline.
2. The necessary data is collected by MSP
3. MSP delivers the necessary information to the MCP provider according to an agreed process.
4. MCP provider validates the information
5. MCP provider uses internal tools to update the service information

### Post-Conditions

The service information in the MSR has been updated.

## Use Case 9: Remove service

* **Who:** A maritime service owner
* **Wants to:** Remove service information from registry
* **So that:** The MSR provides accurate information

### Description

If a service instance is no longer available or a ship system or any other system registered in the service registry for discoverability should no longer be available, a process needs to be in place to enable the removal of the information from the service registry.

### Actors

* Service provider or ship system
* MCP provider
* MSR

### Frequency of Use

Infrequent for maritime services. For systems that are mainly consumers of services but need to register for discoverability the need may be more frequent depending on findability in global search.

### Pre-Conditions for all variations

Service is registered in MSR. Ship systems are identified by having an MMSI and optionally an IMO number as a part of the service information.

### Ordinary Sequence for service providers

1. Service provider contacts MCP provider via agreed upon method to remove service from MSR
2. MCP provider validates the request (exact process depends on provider)
3. MCP provider sets the status of the service to “deleted”
4. MSR no longer returns the service in search results
5. After a grace period of 14 days the service is removed from the registry automatically

### Ordinary Sequence for ship systems

1. Ship systems submits an automated request for ship system removal from MSR to MSR
2. MSR notifies MCP provider of removal request
3. MCP provider validates the request (exact process depends on provider)
4. MCP provider sets the status of the service to “deleted”
5. MSR no longer returns the service in search results

### After a grace period of 14 days the service is removed from the registry automaticallyPost-Conditions

Service is no longer discoverable via MSR

## Use Case 10: Clean up registry content

* **Who:** A MCP provider
* **Wants to:** Ensure that all MSR listings are up to date and valid
* **So that:** The MSR provides accurate information

### Description

While the previous use case describes an ideal scenario where providers of services or ship systems pro-actively ensure that obsolete or defunct entries are removed from the MSR, it is more than likely that MSRs will require regular checking and clean-up of the entries in the registry. This is an important process to ensure that MSRs return results that are fit for purpose.

### Actors

* MCP provider
* MSR

### Frequency of Use

Regularly, for example once a month

### Pre-Conditions

MCP provider has an established process and requirements for services to stay active and discoverable in the MSR that has been communicated to all entities that have registered entries in the MSR.

### Ordinary Sequence

1. Scheduler triggers a regular check in MSR
2. MSR goes through each entry and flags those that fulfil the pre-defined criteria of an entry to become a candidate for removal.
3. MSR notifies MCP provider of resulting list of entries
4. MCP provider goes through each entry removing those that it deems necessary.

### Post-Conditions

Obsolete or defunct entries are removed from MSR and search results return services that are available and fit for purpose.

# Requirements

## Functional requirements

1. **MSR must allow consumers to search for services via an API call**

The attached Open API template for MSR implementations provides a formal listing of all API endpoints and the input and output data for each endpoint. TODO OpenAPI template

* 1. **The search interface must be compatible with the SECOM searchService interface (TODO ref)**

While the interface must be compatible with the searchService interface defined from SECOM all of the parameters defined in SECOM 1.0 are not required. The required parameters and how they work are based on the work done to identify how systems will actually use the API interface to search for services and are not based on the needs of a human user to be able to search for services without knowing exactly what functional needs the service must be able to fulfil.

The searchService must support HTTP POST requests with all parameters in the body. In this case the HTTP header X-Http-Method-Override with the value GET should be passed.

The path to the searchService interface in REST implementations must be /v2/searchService

The searchService must support HTTP GET with query parameters in the query string.

The use of multiple parameters in a single call joins the parameters with an AND statement. OR searches are not supported. Consumers must call searchService multiple times and combine the results to achieve an OR search.

A searchService call without any parameters should not be implemented in consumers. MSR must not consider a search without any parameters as a global search and must treat it as if localOnly=true was passed.

* + 1. **The interface must accept the following parameters:**
       - * **geometry** (string) – geometry of service coverage area in WKT format. Results must include all services for which the coverage area intersects with the geometry and all services without a coverage area defined (i.e. global services).
         * **designId** (MRN) – the MRN of the service design that the service implements. TODO semantic versioning ref.
         * **mmsi** (9 digit number, string) – the MMSI number of the vessel being searched for. This parameter must be used in conjunction with the designId parameter to prevent misuse. If present without the designId parameter, an error with HTTP status code 400 must be returned.
         * **imo** (7 digit number, string) – the IMO number of the vessel being searched for. This parameter must be used in conjunction with the designId parameter to prevent misuse. If present without the designId parameter, an error with HTTP status code 400 must be returned.
         * **instanceId** (MRN) – the MRN of the service instance. This maps to the id-element in the G1128 conformant XML metadata. The version suffix may be omitted and every available version of the instance will be returned. TODO semantic versioning ref.
         * **status** (string) – used to ensure from a consumer point of view that in most cases only released services are returned. If parameter is not passed, MSR must default to the value “released”.
         * **localOnly** (boolean) – used to tell MSR if the search is intended to be local. If not present or unset with a valid boolean value, “false” is used as default and global search is performed.
    2. **The interface may accept the following parameters:**
       - * **name** – TODO insert text
         * **version**
         * **keywords**
         * **description**
         * **dataProductType** (string) – the S-100 data product that is supported by the service. SECOM uses a list where the dash between S and the number is removed. MSR must support searching with both the SECOM format *Sxxx* and the more commonly used *S-xxx*. The values accepted are not limited by the enumeration in SECOM and other data product types may also be supported.
         * **specificationId**
         * **serviceType**
         * **unlocode**
         * **endpointUri**
         * **page** – TODO… only available in localSearch
         * **pageSize**
         * **includeXml**

If any of these values are unsupported but valid values are provided in the search a result must be returned. If only unsupported parameters were passed, a HTTP status 501 not implemented must be returned.

* + 1. **The return values of the search are:**
       - * **transactionId** (UUID) – the UUID given to this transaction. Used to identify subsequent requests from client when polling for global search results
         * **TODO rest of the values**
         * **sourceMSR** (MRN) – attached to each entry when data is received via global search. Left empty or unset for localSearch.
    2. **MSR must allow the consumer to specify if the search is intended to be only local or global**

By local search we mean searching only the registry of the MSR that receives the request. This is done by using the *onlyLocal* parameter defined above. When a global search is performed the consumer is expected to poll the MSR for responses returned from other MSRs.

* + 1. **Local search must be a synchronous call**
    2. **Global search must be a synchronous local search and polling by client to retrieve results from other MSRs**

The polling operation is a HTTP GET request to the URL /v2/retrieveResults/[transactionId]

The polling must be done three (3), six (6) and ten (10) seconds after response to the initial search has been received.

The consumer may poll for extra results at any time between 10 to 30 seconds for extra results.

The search transaction must be held open for 30 seconds on the MSR. Any subsequent results from other MSRs or call to retrieveResults may be ignored.

The MSR must return only new data each time the poll is done.

Paging must not be available when polling.

* + 1. **The interface may require that the consumer has a valid maritime identity**

In many cases where the MSR is intended for use only by consumers that must have a valid maritime identity supplied by a MIR and in those cases, there is no reason for the API to not limit its use for consumers with a maritime identity. However, if the MSR desires it may be open to receiving searches from systems without a valid maritime identity (e.g. for searches from consumer devices). If a valid maritime identity is not required, the results returned from a global search may be severely limited.

If MSR requires a valid maritime identity for searches then a reply with HTTP status code 401 to the consumer if a valid maritime identity was not present. Participants in global search that require a valid maritime identity for searches must not reply.

* + 1. **Vessel endpoint must only be returned to consumers that have provided a valid maritime identity in the search request**

The service is considered a vessel if IMO number or MMSI number is present.

* + 1. **The response of the search must be signed**

When handling results from global search, the MSR that received the search from the consumer must verify all replies from other MSRs but the results received by the consumer must always be signed by the MSR that received the search.

* + 1. **TODO**

1. **The following fields must be available for each entry in the MSR**

See G1128 for the list of fields that must be supported and refer to the instance schema for further technical details. In addition the business rules must be taken into account:

* + - * **IMO or MMSI number** – Must only be present for services that are being registered for vessels to allow for mapping between AIS data and service registry when using MSR to discover endpoints available onboard.
      * **statusEndpoint** – This field must point to the ping interface of the service for all shore based services.

1. **MSR must have an audit log of all changes to registry content**

The audit log must contain information on what, when and who made the change. The audit log must be stored for at least one (1) year.

1. **MSR must allow changes to registry content only from authenticated users**
2. **MSR must enable MCP provider to maintain registry content**
   1. **MSR must have a method of adding, updating and removing entries from the registry by MCP provider**

This guideline does not mandate the method the MCP provider manages the entries in the registry.

* 1. **MCP provider must not have direct access to edit the registry database without all changes to be logged in the audit log**

1. **MSR must enable service providers to automatically update the following instance data**
   * + - **id** – TODO only the version number suffix
       - **version**
       - **endpoint**
       - **serviceApiDoc**
2. **MSR may provide an interface for service providers to update service information**

Service provider must not edit the following fields:

* + - * **id** – except for version number suffix
      * **organizationId** – of either provider or producer

The editability of any other fields in the service information is up to the MSR provider to allow. This guideline does not place any other requirements on how the service providers may update the service information.

1. **MSR may allow service providers to add services to MSR**

The process of how a service provider adds a new service to the registry is not defined in this guideline. It may be via a self-service portal or via a more manual process through the MSR provider. All of the information about the service must be provided by the service provider with the exception of the following:

* + - * **id** – This is determined by the certificate and depends on the MIR process for providing new identities.
      * **organizationId** – of either the provider or producer and for the aforementioned reason.

1. **Adding vessels to MSR must follow the same process as adding new services to MSR**

Vessels should be added to only one MSR that participates in global search if they need to be discoverable. The MSR they are added to should belong to the same MCP domain that has issued the maritime identity for the vessel.

If the vessel has multiple endpoints for different designs that it implements then multiple entries for the vessel are required in the MSR.

The following information must be present for a vessel added to a MSR:

* MMSI and/or IMO to allow for mapping between AIS etc data and vessel MRN

1. **MSR must allow multiple entries from a single id**

The id must not be used as a primary key as e.g. vessels may need to have several entries in the MSR in order to have different endpoints for different service designs that they support.

1. **id requirements**
   1. **id must be a valid and unique MRN for that instance**

The only requirement for an id is that it is a valid MRN and globally unique. MCP providers must ensure that a service added to the registry is either being added only to that registry or that a global search produces a result/results that are identical to the service being added to the registry. This means that an instance may be registered in multiple MSRs.

* 1. **id must not be assumed to have semantic meaning**
  2. **id must match certificate MRN**

1. **MSR must check the availability of services regularly**

All services registered in the MSR must support the ping interface defined in 4.1.5

The call to the ping interface must be done at least once a day. If no response is received, the call must be retrieved for six (6) times every ten (10) minutes or until response is received. If no response is received, service must be flagged for review.

Entries in registry that have a MMSI and/or IMO number must not be pinged. These entries should not have the statusEndpoint field populated.

1. TODO

## NON-FUNCTIONAL REQUIREMENTS

1. **Consumer must allow the human end-users to verify the list of services retrieved and selected**

This means that the human end-user needs to be able to see the search or searches that were submitted, the returned results and the used services. It is important to keep in mind that the MSR is intended as a technical service registry and as such, the consumer of a MSR should always be an information system and not a human user. In most cases requiring a human user to do service selection will increase cognitive load and reduce the utility of the information systems.

1. TODO DDOS protection
2. TODO spamming protection
3. TODO MSR governance – requirements for joining global search platform
4. TODO Trust – users trust of MSR, MSR operator trust of services etc
5. TODO Registry cleanup (data accuracy)
6. TODO Availability – 99,9%?
7. **Consumer will not receive any information on whether using the service returned will accrue costs to consumer**

## Global search platform requirements

TODO Issues that need resolving:

* Are these requirements all a must? A compliant MSR must participate in global search platform but can filter what they return as results
* MSR may filter the results they get from other MSRs before returning the results to consumer
* Initial set of subjects
* If subjects need to be changed (split, added, removed, whatever), how is that information propagated to all MSRs?
* Who bears the cost of the global search network? Mitigating costs

# Interface definitions

For all the interfaces defined below, only a REST interface is defined. No other methods of interacting with the MSR are defined at this point of time.

TODO

## Consumer interfaces

The definition of this interface is intended to be compatible with the search service interface defined in SECOM (TODO reference). As such, the list of parameters includes many parameters that are defined as must be ignored as the data model of services does not support those parameters.

### Operation GET /v2/searchService

#### Request parameters

#### Service response

See below 5.1.3

### Operation POST /v2/searchService

This is defined to be compatible with the searchService operation as defined in SECOM and as such supports a much larger set of parameters in the request body.

#### Request parameters

No request parameters are supported when using the POST operation.

#### Request body

List of params…

#### Service response

See below 5.1.3

### /v2/searchService response

### Operation GET /v2/retrieveResults

consumer pull interface

### Operation GET /v2/ping

## service interfaces

interfaces for automated service information update

optional interfaces for automated service registration

## Global search interfaces

global search interfaces and Mapping of MMS subjects to geometries / search parameters

# abbreviations

TODO

This section should be typed with the **Abbreviations** style. The acronym or initialism is typed and then tab is pressed so that the style inserts the appropriate tabs and paragraph spacings e.g.:

NGO Non-governmental organization

VTS Vessel Traffic Services

The list should be typed in alphabetical order. The text automatically aligns as an indented paragraph until carriage return is hit and then the next term can be entered.

# references

TODO

References are sources directly referred to in the running text and should be given a sequential number, starting at 1. The reference number should be included as close to the referenced text as possible and included as a number within square brackets.

The reference should be listed in the References section in the following syntax using the **Reference** **list** style:

[Author surname,] <space> [initial.] <space> [year] <space> [title.]

For example:

“Hawking also suggests ways that quantum mechanics can be combined with the theory of special relativity [1]. This text builds on his discussion of the instability of black holes described in *A Brief History of Time* [2].”

should be included in the reference list as follows:

1. Hawking, S. (2001) The Universe in a Nutshell.
2. Hawking, S. (1988) A Brief History of Time.
3. RFC 2119 https://www.rfc-editor.org/rfc/rfc2119

The **Reference list** style will add a number for the reference as soon as you start typing the text and the paragraph will automatically align with the first line of text. Press return to enter a new reference in the list.

# Index

**No index entries found.**

1. Example of appendix Title (Head 1) style

Appendices should be started on a separate page and contain information that is directly relevant to the main body of the text at a certain point, but that would be too large or distracting to include at that particular point. There are four levels of appendix heading styles available in the **Style Gallery.**

* 1. Example of Appendix Head 1 style
     1. Example of Appendix Head 2 Style

At the end of the **Appendix head 2** style text press carriage return, the following paragraph is **the Heading 1 separation line** style, press carriage return again, and the following line will be in **Body text** style.

* + - 1. Example of Appendix head 3 style

The same following formatting applies to the **Appendix Head 3** style i.e., press carriage return, the following paragraph is the **Heading 2 separation line** style, press carriage return again, and you will be back to body text.

* + - * 1. Example of Appendix Head 4 style

The Appendix Head 4 style is followed by body text and does not have a separation line. Only the level 1 **Appendix Title** will appear in the TOC.

* + - * 1. Example of Appendix Head 5 style

The **Appendix Head 5 style** is followed by body text and does not have a separation line. Figure and tables should be labelled as a continuation from the main Guideline content.

1. Example of Annex title (Head 1) style

Annexes should include information that can exist in isolation e.g.

* a technical specification for a new piece of equipment;
* the content and structure of a new training module; or
* the detail associated with a new recommendation for an AIS.

Annexes can include appendices if required. There are also four levels of annex heading styles available in the **Style Gallery.** In addition to the **Annex title** (**Head 1)** style there is **Annexe Head 2**, **Annexe Head 3** and **Annexe Head 4**. These follow a similar format to the appendix heading styles. As many annexes can be included as needed and it is advisable to separate them with a page break. Only the level 1 **Annex title** style text will appear in the TOC.

* 1. Example of Annex Head 2 style
     1. Example of Annex Head 3 style
        1. Example of Annex Head 4 style

Annex figures and tables should be labelled with the **Annex Figure Caption** and **Annex Table Caption** styles respectively, rather than the main figure and table caption styles. This ensures the annex can be read logically in isolation and that annex figures and tables are not included in the List of Figures and Tables respectively on the main Guideline contents page.

1. Example of annex figure caption
   * + - 1. Example of Annex Head 5 style