
Service specification for the MCP Service Registry Global Ledger

MCP Consortium



November 17, 2022

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1 Introduction

The International Maritime Organization (IMO) in its ‘Strategy for the development and implementation of e-Navigation’ (MSC85/26, Annex 20) [2] resolution, provides the following definition of e-Navigation:

E-Navigation, is the harmonised collection, integration, exchange, presentation and analysis of maritime information on-board and ashore by electronic means to enhance berth-to-berth navigation and related services, for safety and security at sea and protection of the marine environment.

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” [3], IMO defines Maritime Services and Technical Services in the context of e-Navigation. In this 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 in order to carry out a Maritime Service.

The MCP Service Registry [4] service, or MSR for short, assumes the role of a general registry for Technical Services. It provides a reference point to the most relevant information and the respective end-points of the registered services and thus to improve the accessibility of available services in the maritime domain.

The Technical Services in the resolution are defined on three levels following the same structure as in IALA G-1128 [1] guideline. The MSR supervises all service providers to describe their service in the format of G-1128. MSR contains service information from those the three levels to facilitate the service discoverability, but services without the G-1128 documentation also can be registered.

1.1 Purpose

The purpose of the MSR Global Ledger service is to act as an auxiliary extension to the MSR for enabling global service discoverability by allowing different MSR instances to register information about service instances that are registered in the individual MSR instances that service consumers can then use to find out which MSR to contact to get the actual service endpoint for a service instance.

1.2 Intended readership

This service specification is intended to be read by service architects, system engineers and developers in charge of designing and developing an instance of the MCP Service Registry Global Ledger service.

Furthermore, this service specification is intended to be read by enterprise architects, service architects, information architects, system engineers and developers in pursuing architecture, design and development activities of other related services.

1.3 Inputs from other sources

This section provides an overview of activities, which are dealing with similar topics and lists already finished ones that provided inputs to this activity.

2 Service identification

The purpose of this section is to provide a unique identification of the service and describe where the service is in terms of the engineering lifecycle.

Attribute	Content
Name	Maritime Service Registry Global Ledger
ID	urn:mrn:mcp:service:mcc:mcc:specification:msr-ledger
Version	0.0.1
Description	A global ledger acting as a reference point to provide metadata about where to find the information on services instances that are registered in different Maritime Service Registries.
Keywords	service, registry, discoverability, specification, G-1128, technical, global, ledger, distributed
Architect(s)	MCC MSR WG
Status	Provisional

3 Operational context

This section describes the context of the service from an operational perspective.

3.1 Functional and non-functional requirements

3.1.1 Functional requirements

Requirement Id	Requirement Name	Requirement Text	References
MSR-FR001	Service Reference Registration	Allow the registration of a new reference to a service instance and the MSR that it is registered in.	MCC MSR WG
MSR-FR002	Service Reference Update	Allow updates of existing service instance references.	MCC MSR WG
MSR-FR003	Global Service Discoverability	Allow services to be globally discoverable across several different MSRs.	MCC MSR WG

3.1.2 Non-functional requirements

Requirement Id	Requirement Name	Requirement Text	References
MSR-NFR001	Authenticity	The service consumer must be able to verify the authenticity of the received data.	MCC MSR WG

Requirement Id	Requirement Name	Requirement Text	References
MSR-NFR002	Integrity	The service consumer must be able to verify that the received data has not been tampered with.	MCC MSR WG

4 Service overview

This section aims at providing an overview of the main elements of the service.

4.1 Service interfaces

This section describes the interfaces of the service including the selected Message Exchange Pattern (MEP) by using UML diagrams that illustrate the service interfaces definitions and operations and in tabular form. A UML diagram showing all the service interfaces of the service can be seen in fig. 1.

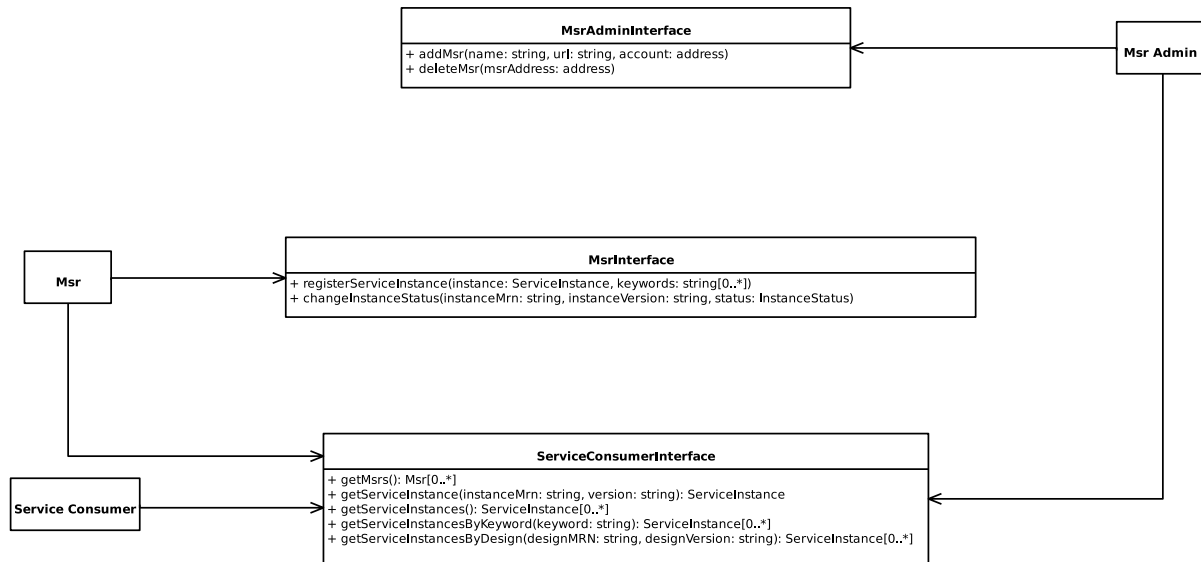


Figure 1: MSR Global Ledger Interface Definition Diagram

Service Interface	Role (from service provider point of view)	Service Operation
MsrAdminInterface	Provided	addMsr deleteMsr
MsrInterface	Provided	registerServiceInstance changeInstanceStatus
ServiceConsumerInterface	Provided	getMsrs getServiceInstance getServiceInstances getServiceInstancesByKeyword getServiceInstancesByDesign

5 Service data model

This section describes the information model, i.e., the logical data structures to be exchanged between providers and consumers of the service.

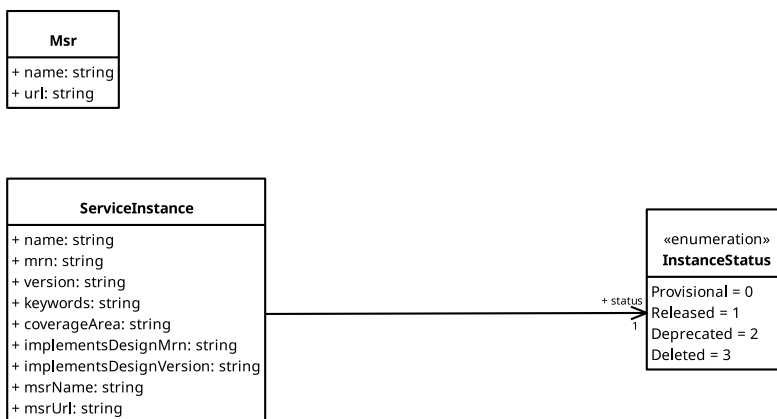


Figure 2: UML class diagram of data model

5.1 Msr

The *Msr* type is a representation of an MSR instance that is registered in the MSR Global Ledger and has permissions to register and update service instances.

Attribute	Type	Description
name	string	The name of the MSR instance represented
url	string	The URL of the API of the MSR instance represented

5.2 InstanceStatus

The *InstanceStatus* type is an enumeration that has values for the different possibilities for the operation status of a service instance according to G-1128.[1]

Attribute	Type	Description
Provisional	element	Corresponds to PROVISIONAL in G-1128
Released	element	Corresponds to RELEASED in G-1128
Deprecated	element	Corresponds to DEPRECATED in G-1128
Deleted	element	Corresponds to DELETED in G-1128

5.3 ServiceInstance

The *ServiceInstance* type is a representation of a reference to a service instance that is registered in a specific MSR.

Attribute	Type	Description
name	string	The name of the service instance
mrn	string	The MRN of the service instance
version	string	The version of the service instance
keywords	string	The keywords that the service instance is indexed by represented as a single string where the individual keywords are comma separated

Attribute	Type	Description
coverageArea	string	The geographical coverage area that the service instance covers represented as a string which is formatted according to either UN/LOCODE or WKT
status	InstanceStatus	The operation status of the service instance
implementsDesignMRN	string	The MRN of the service design that the service instance implements
implementsDesignVersion	string	The version of the service design that the service instance implements
msrName	string	The name of the MSR instance that service instance is registered in
msrUrl	string	The URL of the API of the MSR instance that the service instance is registered in

6 Service interface specifications

This section describes the details of each service interface. One sub-section is provided for each Service Interface. The Service Interface specification covers only the static design description while the dynamic design (behaviour) is described in section D 5.

6.1 Service interface *MsrAdminInterface*

The *MsrAdminInterface* interface is used by administrators to add MSRs that should be allowed to register service instances in the ledger and also to them again if their privilege should be revoked for one reason or another.

6.1.1 Operation *addMsr*

The purpose of the *addMsr* operation is to allow administrators of the MSR Global Ledger to add MSR instances to the MSR Global Ledger's internal index of MSRs and at the same time give the added MSR instances permission to register service instances.

6.1.1.1 Operation functionality Upon receiving a request to add an MSR from a user, the MSR Ledger will first check if the user has the administrative permissions to do so. If the user does not have the necessary permissions, the MSR Ledger will stop execution and optionally return a response with the failure reason to the user. If the user does have the necessary permissions, the MSR Ledger will create an *Msr* object representation of the MSR using the given information, create an entry that maps from the given address of the MSR to the created representation in its internal index of MSRs and assign permissions for creating and updating service instances to the added MSR.

6.1.1.2 Operation parameters

Parameter (in)	Type	Mult.	Description
name	string	1	The name of the MSR that is to be added
url	string	1	The URL of the API of the MSR that is to be added
account	address	1	The account address in the MSR Ledger of the MSR that is to be added

Return Type (out)	Type	Mult.	Description
result from operation	none string	1	The result of the add operation. Will be empty if successful, else it will contain the failure reason as a string

6.1.2 Operation *deleteMsr*

The purpose of the *deleteMsr* operation is to allow administrators of the MSR Global Ledger to delete previously added MSR instances from the internal index and also revoke their permission to register service instances. In addition to the previous the MSR Global Ledger will also update all service instances that were registered by the deleted MSR instance with the *status* attribute set to **Deleted**.

6.1.2.1 Operation functionality Upon receiving a request to add an MSR from a user, the MSR Ledger will first check if the MSR has the necessary permissions to do so. If the MSR does not have the necessary permissions, the MSR Ledger will stop execution and optionally return a response with the failure reason to the user. If the user does have the necessary permissions, the MSR Ledger will

delete the MSR entry that maps from the given account address in its internal index and revoke the permissions of the MSR with the given account address.

6.1.2.2 Operation parameters

Parameter (in)	Type	Mult.	Description
msrAddress	address	1	The account address of the MSR that is to be deleted

Return Type (out)	Type	Mult.	Description
result from operation	none string	1	The result of the delete operation. Will be empty if successful, else it will contain the failure reason as a string

6.2 Service Interface *MsrlInterface*

The *MsrlInterface* interface is used by MSR instances, that have necessary permissions, to register and change the status of service instances.

6.2.1 Operation *registerServiceInstance*

The purpose of the *registerServiceInstance* operation is to allow MSR instances that have the necessary permissions to register service instances in the MSR Global Ledger.

6.2.1.1 Operation functionality Upon receiving a request to register a service instance from an MSR instance, the MSR Ledger will first check if the MSR has the necessary permissions to do so. If the MSR does not have the necessary permissions, the MSR Ledger will stop execution and optionally return a response with the failure reason to the MSR. If the MSR does have the necessary permissions, the MSR Ledger will update the received *ServiceInstance* object with the name and URL of the MSR that sent the request. Then the MSR Ledger will store the *ServiceInstance* object in its internal list of service instances and also index it according to the given list of keywords.

6.2.1.2 Operation parameters

Parameter (in)	Type	Mult.	Description
instance	ServiceInstance	1	The service instance that should be registered
keywords	string	0..*	A list of keywords that the service instance should be indexed by

Return Type (out)	Type	Mult.	Description
result from operation	none string	1	The result of the registering operation. Will be empty if successful, else it will contain the failure reason as a string

6.2.2 Operation *changeInstanceStatus*

The purpose of the *changeInstanceStatus* operation is to allow an MSR instance to update the status of a service instance it has previously registered.

6.2.2.1 Operation functionality Upon receiving a request to change the status of an existing service instance, the MSR Ledger will check if the MSR has the necessary permissions to do so, and also that the MSR sending the request is the one that originally registered it. If any of these checks fail, the MSR Ledger will stop execution and optionally return a response with the failure reason to the MSR. If the checks succeed, the MSR Ledger will update the service instance in question with the given service status.

6.2.2.2 Operation parameters

Parameter (in)	Type	Mult.	Description
instanceMrn	string	1	The MRN of the service instance that is to be updated
instanceVersion	string	1	The version of the service instance that is to be updated

Parameter (in)	Type	Mult.	Description
status	InstanceStatus	1	The instance status that the service instance is to updated with

Return Type (out)	Type	Mult.	Description
result from operation	none string	1	The result of the registering operation. Will be empty if successful, else it will contain the failure reason as a string

6.3 Service interface *ServiceConsumerInterface*

The *ServiceConsumerInterface* interface is used by service consumers to get the list of MSR instances that are registered and to get registered service instances.

6.3.1 Operation *getMsrs*

The *getMsrs* operation allows service consumers to get the list MSR instances that are registered in the MSR Global Ledger.

6.3.1.1 Operation functionality Upon receiving a request to get the list of MSR instances the MSR Ledger will return the list of MSR instances.

6.3.1.2 Operation parameters

Parameter (in)	Type	Mult.	Description
Return Type (out)	Type	Mult.	Description
result from operation	Msr	0..*	The list of MSR instances that are registered in the MSR Global Ledger

6.3.2 Operation *getServiceInstance*

The *getServiceInstance* operation allows service consumers to get a service instance with a specific MRN and version.

6.3.2.1 Operation functionality Upon receiving a request for getting a service instance, the MSR Global Ledger will look up in its list of service instances to find one with the given MRN and version. If no service instance was found, the MSR Ledger will return a *ServiceInstance* object where all attributes are empty.

6.3.2.2 Operation parameters

Parameter (in)	Type	Mult.	Description
instanceMrn	string	1	The MRN of the service instance to be returned
version	string	1	The version of the service instance to be returned

Return Type (out)	Type	Mult.	Description
result from operation	ServiceInstance	1	The service instance that was found based on the given parameters

6.3.3 Operation *getServiceInstances*

The *getServiceInstances* operation allows service consumers to get the list of all service instances that are registered in the MSR Global Ledger.

6.3.3.1 Operation functionality Upon receiving a request to get the list of service instances, the MSR Ledger will return the list of all registered service instances.

6.3.3.2 Operation parameters

Parameter (in)	Type	Mult.	Description
Return Type (out)	Type	Mult.	Description
result from operation	ServiceInstance	0..*	The list of all service instances that are registered in the MSR Global Ledger

6.3.4 Operation *getServiceInstancesByKeyword*

The *getServiceInstancesByKeyword* operation allows service consumers to get the list of all registered service instance that have a given keyword.

6.3.4.1 Operation functionality Upon receiving a request for getting service instances by a keyword, the MSR Global Ledger will look up in its index to find all service instances that have the given keyword in their lists of keywords. All the found service instances will be collected in a list which is then returned to the service consumer.

6.3.4.2 Operation parameters

Parameter (in)	Type	Mult.	Description
keyword	string	1	The keyword that will be used to find service instances

Return Type (out)	Type	Mult.	Description
result from operation	ServiceInstance	0..*	The list that contains all the registered service instances that have the given keyword

6.3.5 Operation *getServiceInstancesByDesign*

The *getServiceInstancesByDesign* operation allows service consumers to get the list of service instances that implement a given service design.

6.3.5.1 Operation functionality Upon receiving a request to the list of service instances that implement a given service design, the MSR Global Ledger will look up in its index to find all service instances that implement the given service design. All the found service instances will be collected in a list which is then returned to the service consumer.

6.3.5.2 Operation parameters

Parameter (in)	Type	Mult.	Description
designMRN	string	1	The MRN of the service design that the service instances implement
designVersion	string	1	The version of the service design that the service instance implement

Return Type (out)	Type	Mult.	Description
result from operation	ServiceInstance	0..*	The list that contains all the registered service instances that implement the given design MRN and version

7 Service dynamic behaviour

This section describes the interactive behaviour between service interfaces (interaction specification).

7.1 Service interface *MsrAdminInterface*

As described in sec. 6.1, *MsrAdminInterface* contains functions for adding and deleting MSR instances in the Global Ledger.

As shown in fig. 3 an MSR needs to be added before it can be deleted.

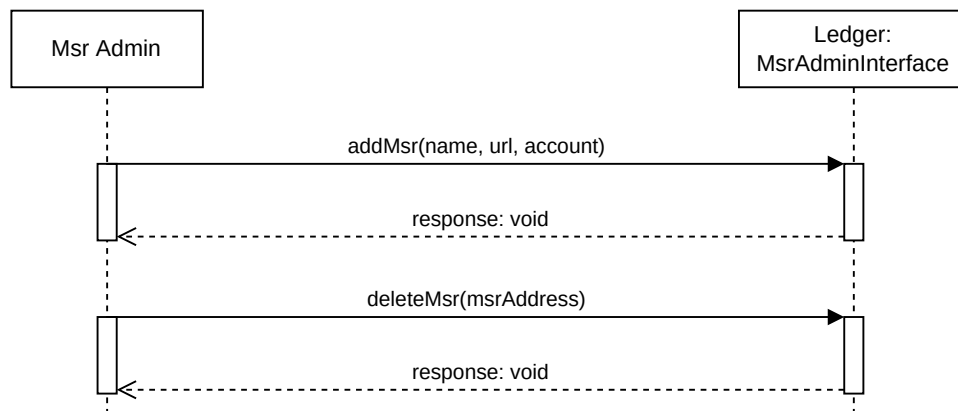


Figure 3: MSR Admin Interface Operation Sequence Diagram

7.2 Service Interface *MsrInterface*

The dynamic behaviour of the MsrInterface (see sec. 6.2) is shown in fig. 4. As seen, a specific MSR instance needs to be registered by an MSR admin in the MsrAdminInterface (see sec. 7.1) before it is allowed to register service instances in the Global Ledger. Additionally, a service instance needs to have been registered by an MSR before the same MSR can change its instance status.

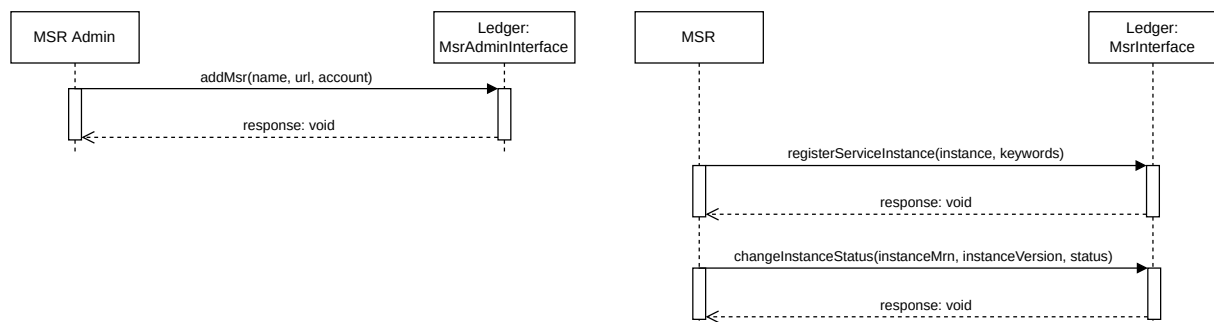
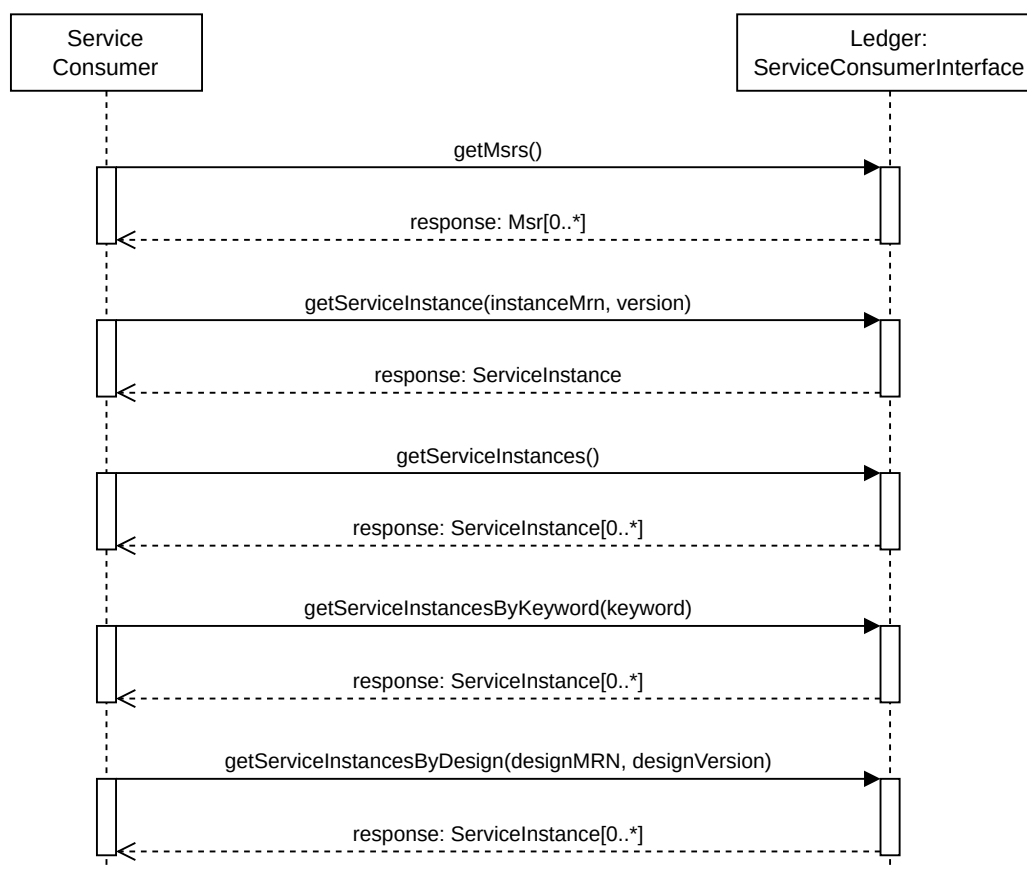


Figure 4: MSR Interface Operation Sequence Diagram

7.3 Service Interface *ServiceConsumerInterface*

As described in sec. 6.3, ServiceConsumerInterface contains functions that can be used by service consumers for global service discoverability. The sequence diagram shown in fig. 5 shows the dynamic behaviour of the functions of the interface. The shown order of operations should not be considered as required, as any of the functions can be called at any time.

**Figure 5:** Service Consumer Interface Operation Sequence Diagram

8 Service provisioning (Optional)

A description should be given.

9 Definitions

The definitions of terms used in this document can be found in the International Dictionary of Marine Aids to Navigation (IALA Dictionary) at <http://www.iala-aism.org/wiki/dictionary> and were checked as correct at the time of going to print. Where conflict arises, the IALA Dictionary shall be considered as the authoritative source of definitions used in IALA documents.

9.1 Terminology

Persons producing the Technical Service are invited to add definitions to the following list as appropriate.

Term	Definition
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IMO	International Maritime Organization
MCC	Maritime Connectivity Platform Consortium
MCP	Maritime Connectivity Platform
MIR	Maritime Identity Registry
MRN	Maritime Resource Name
MSR	Maritime Service Registry

References

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