Service Directory 1.0

OpenO&M Specification

2021-04-16

Editors

Avin Mathew, MIMOSA

Ken Bever, MIMOSA

Status

This specification was available on MIMOSA website as a draft MIMOSA specification till the above date and has been released as an OpenO&M specification on the above date. Check the Latest Version for possible later revisions of this document.

This document is considered stable and may be used as reference material or cited as a normative reference from another document.

The latest stable version of the editor's draft of this specification is always available on the *MIMOSA Service Directory Git repository* [https://github.com/mimosa-org/service-directory].

If you wish to make comments regarding this specification in a manner that is tracked by the OIIE O&M Working Group, please submit them via *the public bug database* [https://github.com/mimosa-org/service-directory/issues]. You can alternatively *contact MIMOSA directly* [http://www.mimosa.org/contact] and arrangements will be made to transpose appropriate remarks to the public bug database. All feedback is welcome.

Latest Version

This is version 1.0 which can be found at: *http://www.openoandm.org/service-directory/1.0*
The latest published version of this specification can always be found at: *http://www.openoandm.org/service-directory/latest*

Notices

All capitalized terms in the following text have the meanings assigned to them in the MIMOSA Intellectual Property Rights Policy (the "MIMOSA IPR Policy"). The full Policy may be found at the *MIMOSA website* [http://www.mimosa.org/policy-charters/mimosa-intellectual-property-rights-policy/].

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published, and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this section are included on all such copies and derivative works. However, this document itself may not be modified in any way, including by removing the copyright notice or references to MIMOSA, except as needed for the purpose of developing any document or deliverable produced by a MIMOSA Technical Committee (in which case the rules applicable to copyrights, as set forth in the MIMOSA IPR Policy, must be followed) or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by MIMOSA or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and MIMOSA DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY OWNERSHIP RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

MIMOSA requests that any MIMOSA Party or any other party that believes it has patent claims that would necessarily be infringed by implementations of this MIMOSA Final Deliverable, to notify MIMOSA TC Administrator and provide an indication of its willingness to grant patent licenses to such patent claims in a manner consistent with the IPR Mode of the MIMOSA Technical Committee that produced this deliverable.

MIMOSA invites any party to contact the MIMOSA TC Administrator if it is aware of a claim of ownership of any patent claims that would necessarily be infringed by implementations of this MIMOSA Final Deliverable by a patent holder that is not willing to provide a license to such patent claims in a manner consistent with the IPR Mode of the MIMOSA Technical Committee that produced this MIMOSA Final Deliverable. MIMOSA may include such claims on its website but disclaims any obligation to do so.

MIMOSA takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this MIMOSA Final Deliverable or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on MIMOSA's procedures with respect to rights in any document or deliverable produced by a MIMOSA Technical Committee can be found on the MIMOSA website. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this MIMOSA Final Deliverable, can be obtained from the MIMOSA TC Administrator. MIMOSA makes no representation that any information or list of intellectual property rights will at any time be complete, or that any claims in such list are, in fact, Essential Claims.

The OpenO&M Service Directory is released under the *MIMOSA License Agreement* [http://www.mimosa.org/policy-charters/mimosa-license-agreement/].

Version 1.0

Contents

Foreword

This document describes a Web Service interface for interacting with the Service Directory for the purpose of standardized registration and lookup of OIIE services for a given scope and receives the applicable ISBM configuration details.

OpenO&M is an initiative of multiple industry standards organizations to provide a harmonized set of standards for the exchange of Operations & Maintenance (O&M) data and associated context. OpenO&M is an open, collaborative, effort composed of diverse groups of relevant organizations and subject matter experts. The members of OpenO&M initiative include ISA, MESA, MIMOSA, OAGi, and the OPC Foundation.

- MIMOSA provides asset management related information standards
- ISA provides industrial automation standards
- OPC Foundation provides data acquisition and transport standards

Participating organizations work together to cross-reference their related standards, collaborate on the content and where possible to incorporate each-others work by reference, with the objective of providing a foundation for standards-based interoperability.

The specification described in this document is a specification as opposed to a standard. This specification is validated for ease of implementation and use via reference implementations made available by the OIIE O&M Working Group members, e.g., the *Service Directory* [https://github.com/assetricity/service_directory], but this does not preclude commercial implementations from being developed to conform to this specification.

The features and capabilities of the specification will be validated through the future phases of the *OIIE OGI Pilot* [http://www.mimosa.org/ogi-pilot/] to ensure that it is fit-for-purpose. The OIIE OGI Pilot also provides feedback into this specification for new features, capabilities, and requirements that are considered in future revisions of the specification.

Introduction

The OpenO&M Service Directory specification provides a specification for a Web Service interface for interactions with a Service Directory. This supports the standardized registration and lookup of OIIE compliant services with corresponding scopes and ISBM configuration information.

The Service Directory provides centralized configuration management for the routing of services within an ISBM. An administrator defines applications, the services that each application supports (e.g. publishing information or responding to requests), the scope of the service (e.g. a region or site, a data class such as equipment types, or for an instance of a data class such as a pump), and the corresponding ISBM endpoint, channel, topics, and tokens. An application would then register the services it can provide for a scope with the Service Directory and receive the corresponding ISBM configuration information. Subsequently, applications that need to subscribe or request data would query the Service Directory for a service type and scope and receive the applicable ISBM configuration.

Service Directory 1.0

1 Scope

This is a specification of a set of Web Service interfaces for interacting with the Service Directory.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IETF RFC 2616, Hypertext Transfer Protocol HTTP/1.1, 1999

W3C Recommendation, XML Schema Part 1: Structures Second Edition, 2004

W3C Recommendation, XML Schema Part 2: Datatypes Second Edition, 2004

OASIS Standard, Web Services Security: SOAP Message Security 1.0, 2004

3 Terms, Definitions, and Conventions

3.1 Terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at *http://www.iso.org/obp*
- IEC Electropedia: available at *http://www.electropedia.org/*

interface
definition of a set of operations that can be performed by a software system

EXAMPLE 1 The WSDL definition of the Channel Management Service would be its SOAP interface.

Namespace
collection of names or words that define a formal and distinct set

[SOURCE: ISA-95.00.06-2014, 3.1.9]

NamespaceFault
error indicating that duplicate namespace prefixes occur in the namespace parameters

NOTE 1 Namespaces prefixes MUST be unique.

NamespaceName

name used for an XPath/JSONPath filter expression

NamespacePrefix
prefix used for an XPath/JSONPath filter expression

SecurityToken
physical device or software code used to gain access to a channel

[SOURCE: ISA-95.00.06-2014, 3.1.10]

Topic
identification of the information content in a message

[SOURCE: ISA-95.00.06-2014, 3.1.12]

Web Service
software system designed to support interoperable machine-to-machine interaction over a network

[SOURCE: https://www.w3.org/TR/2004/NOTE-ws-gloss-20040211/#webservice]

NOTE 1 It has an interface described in a machine-processable format (specifically WSDL). Other systems interact with the Web Service in a manner prescribed by its description using SOAP-messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.

NOTE 2 This definition only applies when this capitalization is used.

3.2 Notational Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in *RFC 2119* [http://www.ietf.org/rfc/rfc2119.txt].

3.3 Schema Namespaces

The following namespaces are used in this document:

Prefix	Namespace
xs	http://www.w3.org/2001/XMLSchema
xsi	http://www.w3.org/2001/XMLSchema-instance
sd	*http://www.openoandm.org/service-directory/*
oa	http://www.openapplications.org/oagis/9

4 Functional Requirements

The functional requirements below are the minimum set of requirements that a Service Directory needs to fulfill to provide value in an OIIE Architecture. Software vendors MAY identify additional functional requirements to provide added value for their products, as long as these added requirements do not conflict with the requirements below.

4.1 Service Registration and Discovery

A Service Directory MUST provide a way for a user to identify a service configuration by specifying an association between a system (e.g., software application) and the corresponding ISBM configuration.

The ISBM configuration MUST consist of:

- Endpoint type (e.g. Provider Publication, Consumer Request)
- Web Service endpoint for the endpoint type
- Channel
- Topic
- Security Token

As per the ISBM specification, the username/password authentication MUST be supported as a basic level of security when defining an ISBM configuration. Additional security token types MAY be supported. Additional security token types MAY be supported. A Service Directory MAY also allow the association of timeframe validity and status metadata (these are supported by the data exchange format detailed below).

4.2 Configuration-ISBM Synchronization

For the service configurations identified by functional requirement 4.1, a Service Directory MUST allow synchronization of the ISBM configuration of the service configuration with an ISBM Service Provider.

If the service configuration is available for query by a system from the Service Directory (see functional requirement **Error! Reference source not found.**), the corresponding ISBM configuration MUST already be synchronized with the ISBM Service Provider. This is to ensure the Service Directory is not providing unusable ISBM configuration details.

Synchronization MUST include:

- Creating channels where necessary
- Adding security tokens for valid services
- Removing security tokens for invalid services

4.3 Query Service

A Service Directory MUST allow other systems to query the service configurations using the *GetIsbmService* Business Object Document (BOD). A Service Directory MUST respond to a *GetIsbmService* query with a *ShowIsbmService* response. The Service Register MUST use a query-by-example approach where the generated response is matched against the filters provided in the query.

A Service Directory MUST support communication using the above-mentioned BODs on an ISBM Request channel using the Provider Request Service. For a *GetIsbmService* message received by the ReadRequest Web Service, the Service Directory MUST send a corresponding *ShowIsbmService* response using the PostResponse Web Service.

5 Service Descriptions

All services described in this section have corresponding examples provided in *Examples section*.

5.1 Get ISBM Service

The GetIsbmService interface is used to request retrieval of a ISBM service configuration. The XML schema of GetIsbmService BOD is provided below.

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:oa="http://www.openapplications.org/oagis/9"
  xmlns:sd="https://www.openandm.org/service-directory"
  targetNamespace="https://www.openoandm.org/service-directory"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified"
  version="1.0">
  <xs:element name="GetIsbmService">
    <xs:annotation>
      <xs:documentation>Used to request retrieval of a ISBM service configuration.</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="oa:BusinessObjectDocumentType">
          <xs:sequence>
            <xs:element name="DataArea" type="sd:GetIsbmServiceDataArea"/>
          </xs:sequence>
        </xs:extension>
      </xs:complexContent>
    </xs:complexType>
  </xs:element>

  <xs:complexType name="GetIsbmServiceDataArea">
    <xs:sequence>
      <xs:element ref="oa:Get"/>
      <xs:element ref="sd:IsbmService" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

</xs:schema>
```

5.2 Show ISBM Service

The ShowIsbmService interface is used to send a ISBM service configuration in response to a GetIsbmService request. The XML schema of ShowIsbmService BOD is provided below.

```
<?xml version="1.0" encoding="utf-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:oa="http://www.openapplications.org/oagis/9"
  xmlns:sd="https://www.openandm.org/service-directory"
  targetNamespace="https://www.openoandm.org/service-directory"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified"
  version="1.0">
  <xs:element name="ShowIsbmService">
    <xs:annotation>
      <xs:documentation>Used to send a ISBM service configuration in response to a GetIsbmService
request.</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:complexContent>
        <xs:extension base="oa:BusinessObjectDocumentType">
          <xs:sequence>
            <xs:element name="DataArea" type="sd:ShowIsbmServiceDataArea"/>
```

```
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>
</xs:element>

<xs:complexType name="ShowIsbmServiceDataArea">
  <xs:sequence>
    <xs:element ref="oa:Show"/>
    <xs:element ref="sd:IsbmService" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>

</xs:schema>
```

6 XML Data Structures

The following data structures are used by the services defined in *Service Descriptions* and are defined using XML Schema. All types have a target namespace of *http://www.openoandm.org/service-directory/*.

6.1 EndpointType

```
<xs:simpleType name="EndpointType">
  <xs:restriction base="xs:string">
     <xs:enumeration value="ProviderPublication"/>
     <xs:enumeration value="ConsumerPublication"/>
     <xs:enumeration value="ProviderRequest"/>
     <xs:enumeration value="ConsumerRequest"/>
  </xs:restriction>
</xs:simpleType>
```

6.2 IsbmService

```
<xs:element name="IsbmService">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Id" type="xs:string" minOccurs="0"/>
      <xs:element name="System" type="xs:string"/>
      <xs:element name="EndpointType" type="sd:EndpointType" minOccurs="0"/>
      <xs:element name="Endpoint" type="xs:string" minOccurs="0"/>
      <xs:element name="Channel" type="xs:string" minOccurs="0"/>
      <xs:element name="Topic" type="xs:string" minOccurs="0"/>
      <xs:element name="Token" type="sd:Token" minOccurs="0">
      <xs:element name="Valid" type="sd:Valid" minOccurs="0"/>
      <xs:element name="Status" type="xs:string" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

6.3 Token

```
<xs:complexType name="Token">
   <xs:sequence>
       <xs:any namespace="##any" processContents="lax"/>
   </xs:sequence>
</xs:complexType>
```

6.4 Valid

```
<xs:complexType name="Valid">
   <xs:sequence>
      <xs:element name="From" type="xs:date" minOccurs="0"/>
      <xs:element name="To" type="xs:date" minOccurs="0"/>
   </xs:sequence>
</xs:complexType>
```

Annex A. Examples

A.1 GetIsbmService Request Example

```
<?xml version="1.0" encoding="utf-8"?>
<sd:GetIsbmService xmlns:oa="http://www.openapplications.org/oagis/9"
  xmlns:sd="https://www.mimosa.org/service-directory"
  releaseID="1.2.1" versionID="1.0">
  <oa:ApplicationArea>
    <oa:Sender>
      <oa:LogicalID>cc555257-b7ed-434d-b216-2f7fb2b3b870</oa:LogicalID>
    </oa:Sender>
    <oa:CreationDateTime>2014-07-01T10:00:00Z</oa:CreationDateTime>
    <oa:BODID>aaf29423-bc83-4680-962c-ddf1bb313ba7</oa:BODID>
  </oa:ApplicationArea>
  <sd:DataArea>
    <oa:Get>
      <oa:Expression />
    </oa:Get>
    <sd:IsbmService>
      <sd:System>cc555257-b7ed-434d-b216-2f7fb2b3b870</sd:System>
      <sd:Channel>\Enterprise\Site A\AssetSegmentEvent\Sync\Checkpoint</sd:Channel>
    </sd:IsbmService>
  </sd:DataArea>
</sd:GetIsbmService>
```

A.2 ShowIsbmService Response Example

```
<?xml version="1.0" encoding="utf-8"?>
<sd:ShowIsbmService xmlns:oa="http://www.openapplications.org/oagis/9"
  xmlns:sd="https://www.mimosa.org/service-directory"
  releaseID="1.2.1" versionID="1.0">
  <oa:ApplicationArea>
    <oa:Sender>
      <oa:LogicalID>977c4b70-7080-48be-a500-8beb6bc2057f</oa:LogicalID>
    </oa:Sender>
    <oa:CreationDateTime>2014-07-01T10:00:00Z</oa:CreationDateTime>
    <oa:BODID>64270c90-73b2-4a28-ae95-720c2d329933</oa:BODID>
  </oa:ApplicationArea>
  <sd:DataArea>
    <oa:Show />
    <sd:IsbmService>
      <sd:Id>459d71e2-5050-4af6-b81b-35f7c05790d2</sd:Id>
      <sd:System>cc555257-b7ed-434d-b216-2f7fb2b3b870</sd:System>
      <sd:EndpointType>ProviderPublication</sd:EndpointType>
      <sd:Endpoint>http://example.com/ProviderPublicationService</sd:Endpoint>
      <sd:Channel>\Enterprise\Site A\AssetSegmentEvent\Sync\Checkpoint</sd:Channel>
      <sd:Topic>OIIE:S10:V1.0\CCOM:SyncAssetInstall:V1.0</sd:Topic>
      <sd:Token>
        <wsse:UsernameToken xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-
wssecurity-secext-1.0.xsd">
          <wsse:Username>PwWcKn33</wsse:Username>
          <wsse:Password>TzW3V$qgCSZm%pdL</wsse:Password>
        </wsse:UsernameToken>
      </sd:Token>
      <sd:Valid>
        <sd:To>2014-09-08T00:00:00Z</sd:To>
      </sd:Valid>
      <sd:Status>Active</sd:Status>
    </sd:IsbmService>
```

```
  </sd:DataArea>
</sd:ShowIsbmService>
```

Annex B. Schema Files and Examples Package

The XML schema of services described in the *Services Descriptions section* and their examples along with referenced OAGIS files are available for download below.

B.1 Packaged Specification

http://www.openoandm.org/service-directory/service_directory_1.0_bods.zip