
**Geographic information —
Ontology —**

**Part 6:
Service ontology register**

*Information géographique — Ontologie —
Partie 6: Registre d'ontologies de service*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 287, *Geographic Information*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 19150 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The Semantic Web has introduced the Web of Data. The Web of Data is essentially an extension of the Web oriented towards machine-processable data as opposed to documents. It can be seen as a tremendous worldwide open database that people can query from their own perspective, understanding or abstraction of real-world phenomena or events. From it, they can find accurate, detailed and appropriate answers as people communicate between one another. This approach involves reasoning capabilities based on ontologies. The Semantic Web brings new opportunities in the geographic information realm to lay out a new generation of standards that will improve semantic interoperability of geographic information.

Fundamentally, 'ontology' comes from the field of philosophy and refers to the study of the nature of the world itself. The information technology and artificial intelligence communities have borrowed the term ontology for the explicit specification of a conceptualization.^[4] In the field of geographic information, ontology consists of a formal representation of phenomena of a universe of discourse with an underlying vocabulary including definitions and axioms that make the intended meaning explicit and describe phenomena and their interrelationships.^[2] Information technology and artificial intelligence consider that reality can be abstracted differently depending on the context from which 'things' are perceived and, as such, recognize that multiple ontologies about the same part of reality can exist. An ontology can be formalized differently ranging from weak to strong semantics: taxonomy, thesaurus, conceptual model, and logical theory.^[4]

On the Semantic Web, ontology defines the meaning of data and describes it in a format that machines and applications can read. An application using data also has access to the inherent semantics of those data through the ontology associated with them. Ontologies can support integration of heterogeneous data captured by different communities by relating them based on their semantic similarity. The World Wide Web Consortium (W3C) has published the Web Ontology Language (OWL) family of knowledge representation languages for authoring ontologies characterized by formal semantics on the Web.^{[5],[7]}

Geographic information Web services are important components that compose the Web. The Semantic Web can contribute to facilitating the interaction between them by introducing an ontology for geographic information Web Services. It can support geographic information Web services to automate their discovery, composition and invocation in order to enable seamless machine interoperation with minimum human interaction. ISO 19150-4 sets out the ontological framework for the ontological description of geographic information Web services. However, the discovery of such services requires the registration of their implementation ontologies. This document sets out a standard registration and maintenance mechanism for the registration of ISO 19150-4-conformant geographic information service ontologies. The intention is for this document to be potentially referenceable by an ISO Registration Authority standard for setting up an international register of geographic information service ontologies. [Annex B](#) of this document provides additional information to enable the registration of GeoWeb service ontology described in other frameworks such as the Semantic Markup for Web Services (OWL-S), the Semantic Web Services Ontology (SWSO), the Web Service Modeling Ontology (WSMO) and the OGC Web Service Common (OWS-C).

This document is not an ISO Registration Authority (RA) document. Any organization may establish a register of service ontologies. If creating an ISO register, this document can act as a supporting document for the ISO RA document for that register.

The purpose of this document is different from that of the ISO/IEC 19763 family of International Standards, which specifies an information artefact called the Registry Summary. The Registry Summary consists of information that describes administrative aspects, the summary of contents and the technical access method of the registry. In contrast, registry based on this document can be described following ISO/IEC 19763-6.

ISO/IEC 18384-3 defines a formal ontology for service-oriented architecture (SOA), an architectural style that supports service orientation. The terms defined in ISO/IEC 18384-3 are key terms from ISO/IEC 18384-1. This document does not provide any architectural style to support service orientation, although GeoWeb service definitions can potentially take advantage of ISO/IEC 18384-3 for their description.

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Geographic information — Ontology —

Part 6: Service ontology register

1 Scope

This document establishes a standard registration and maintenance mechanism for the registration of ISO 19150-4-conformant geographic information service ontologies.

This document makes use of ISO 19135-1 whenever appropriate.

This document does not define semantics operators or rules for ontologies, and does not develop any application ontology.

In relation to ISO 19101-1:2014, 6.2, this document defines and formalizes the following purposes of the ISO geographic information reference model:

- geographic information service components and their behaviour for data processing purposes over the Web; and
- OWL ontologies to cast ISO/TC 211 International Standards to benefit from and support the Semantic Web.

In relation to ISO 19101-1:2014, 8.3, this document addresses the Application:Procedural foundation of the ISO geographic information reference model.

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.

ISO 19101-1, *Geographic information — Reference model — Part 1: Fundamentals*

ISO 19103, *Geographic information — Conceptual schema language*

ISO 19135-1:2015, *Geographic information — Procedures for item registration — Part 1: Fundamentals*

ISO 19150-4, *Geographic information — Ontology — Part 4: Service ontology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19101-1 and ISO 19135-1 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

service

distinct part of the functionality that is provided by an entity through interfaces

[SOURCE: ISO 19119:2016, 4.1.12]

4 Abbreviated terms and namespaces

4.1 Abbreviated terms

GeoWeb service	geographic information web service
ISO RA	ISO registration authority
OGC	Open Geospatial Consortium
OWL	web ontology language
OWL-S	semantic markup for web services
OWS-C	OGC web service common
SOA	service-oriented architecture
SWSO	semantic web services ontology
UML	unified modelling language
URI	universal resource identifier
W3C	World Wide Web Consortium
WSMO	web service modelling ontology

4.2 Namespaces

The name and contact information of the maintenance agency for this document can be found at www.iso.org/maintenance/agencies.

19150-6ServiceOntologyRegister

Requirements class for the identification and description of service ontology register
<https://standards.isotc211.org/iso19150/-6/1/req/ServiceOntologyRegister/>

19150-6ServiceOntologyRegister-conf

Conformance class for the identification and description of service ontology register
<https://standards.isotc211.org/iso19150/-6/1/conf/ServiceOntologyRegister/>

19150-6ServiceOntologyRegisterImplementation

Requirements class for the implementation of a service ontology register
<https://standards.isotc211.org/iso19150/-6/1/req/ServiceOntologyRegisterImplementation/>

19150-6ServiceOntologyRegisterImplementation-conf

Conformance class for the implementation of a service ontology register
<https://standards.iso211.org/iso19150/-6/1/conf/ServiceOntologyRegisterImplementation/>

19150-6ServiceOntologyRegisterManagement

Requirements class for the management of a service ontology register
<https://standards.iso211.org/iso19150/-6/1/req/ServiceOntologyRegisterManagement/>

19150-6ServiceOntologyRegisterManagement-conf

Conformance class for the management of a service ontology register
<https://standards.iso211.org/iso19150/-6/1/conf/ServiceOntologyRegisterManagement-conf/>

5 Conformance

Any service ontology register claiming conformance with this document shall pass the requirements described in the abstract test suite, presented in [Annex A](#).

The abstract test suite is organized in the following conformance classes:

- identification and description of a service ontology register (19150-6ServiceOntologyRegister-conf);
- implementation of a service ontology register (19150-6ServiceOntologyRegisterImplementation-conf); and
- management of a service ontology register (19150-6ServiceOntologyRegisterManagement-conf).

6 Register structure

6.1 General

Geographic information Web services (GeoWeb services) are important components that compose the Web. GeoWeb service ontologies facilitate the interaction between GeoWeb services on the Semantic Web, such as discovery, composition and invocation. The description of GeoWeb services was standardized in ISO 19150-4.

A service ontology register aims to enable organizations that develop and maintain descriptions of GeoWeb service in conformance with ISO 19150-4 to provide their user communities with searching and discovering functionalities of GeoWeb Service ontologies.

A service ontology register provides the mechanism for the registration of ISO 19150-4 GeoWeb service ontologies and their maintenance in the register.

This clause provides the detailed structure of the ISO standardized service ontology register which follows and conforms to ISO 19135-1. ISO 19135-1 specifies procedures to be followed in preparing and maintaining registers of items of geographic information.

6.2 Fundamental structure of the register

The service ontology register is made of three classes that are ServiceOntologyRegister, ServiceOntologyRegisterItemClass, and RegisteredServiceOntology as depicted in [Figure 1](#). These classes are specializations of the ISO 19135-1 RE_Register, RE_Itemclass, and RE_RegisterItem classes respectively. They are described in detail in [6.3](#), [6.4](#) and [6.5](#) respectively.

The service ontology register is a simple register that contains registered service ontologies (i.e. the "items") of a single item class. It is the simplest structure to manage, since the same elements of information are recorded for all items in the register. It imposes a small cost burden on any one register manager.

The requirements for representing a service ontology register have one requirement class, identified as <https://standards.iso.org/iso19150/-6/1/req/ServiceOntologyRegister/> (i.e. 19150-6ServiceOntologyRegister) and are listed in [Table 1](#).

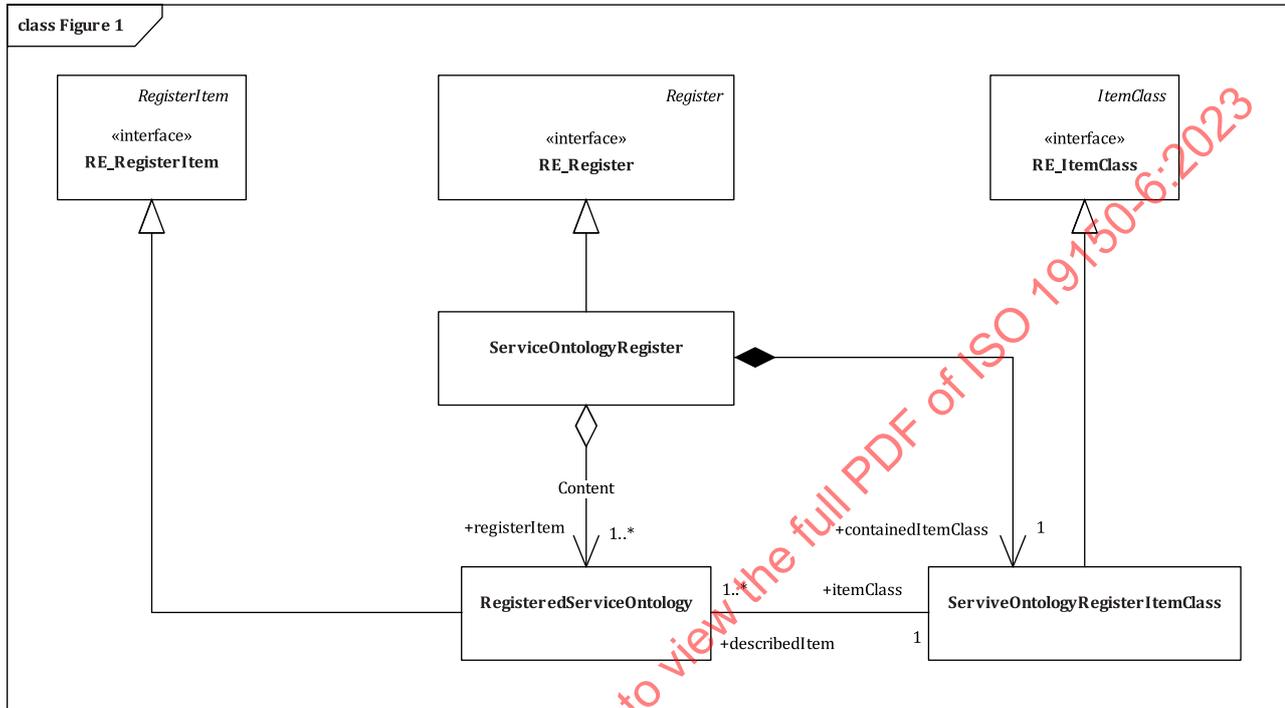


Figure 1 — Service ontology register fundamental class structure

Table 1 — Requirements class for ServiceOntologyRegister

Requirements class	
19150-6ServiceOntologyRegister =	https://standards.iso.org/iso19150/-6/1/req/ServiceOntologyRegister/
Target type	Service ontology register
Dependency	https://standards.iso.org/iso/19103/ed-2/en/ (Conceptual schema language)
Dependency	https://standards.iso.org/iso/19135/-1/ed-2/en/ (Procedures for item registration – Fundamentals)
Dependency	https://standards.iso.org/iso/19150/-4/ed-1/en/ (Ontology – Service ontology)
Requirement	19150-6ServiceOntologyRegister:ServiceOntologyRegister
Requirement	19150-6ServiceOntologyRegister:ServiceOntologyRegisterItemClass
Requirement	19150-6ServiceOntologyRegister:RegisteredServiceOntology

6.3 Service ontology register

6.3.1 Introduction

The class ServiceOntologyRegister ([Figure 2](#)) specifies information about the register itself.

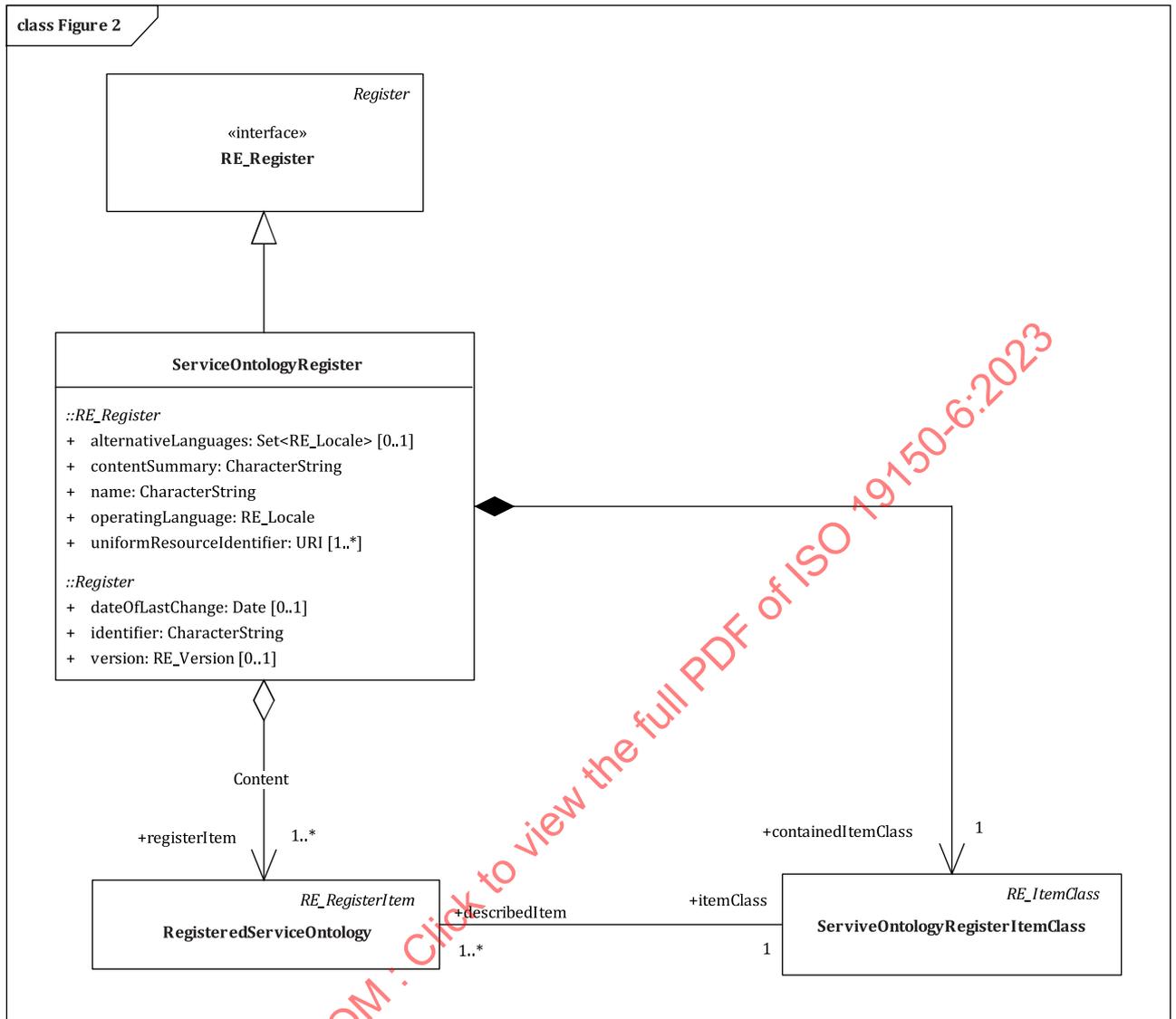


Figure 2 — ServiceOntologyRegister class

6.3.2 Requirements

Table 2 lists the requirements for ServiceOntologyRegister.

Table 2 — ServiceOntologyRegister requirement

Requirement
19150-6ServiceOntologyRegister:ServiceOntologyRegister
ServiceOntologyRegister is a subclass of RE_Register, specified in ISO 19135-1:2015, B.2.2, and shall inherit all its properties (i.e. attributes and roles). They are further described in 6.3.3.

6.3.3 Properties

Table 3 describes the ServiceOntologyRegister properties.

ServiceOntologyRegister is a subclass of RE_Register, specified in ISO 19135-1:2015, B.2.2. It inherits height attributes and six association roles from RE_Register and Register (Table 3).

Table 3 — ServiceOntologyRegister properties

Name	Type	Multiplicity	Inheritance	Definition
identifier	(attribute) Character-String	1	Register	designator that uniquely denotes the register within the set of registers maintained by the register owner NOTE This attribute is equal to the attribute <i>name</i> .
version	(attribute) RE_Version	0..1	Register	specification of a unique state in the life of the register
dateOfLastChange	(attribute) Date	0..1	Register	date of the most recent change to the status of an item in the register
manager	(role) Register-Stakeholder	1	Register	register stakeholder that manages the register
owner	(role) Register-Stakeholder	1	Register	register stakeholder that owns the register
submitter	(role) Register-Stakeholder	1..*	Register	register stakeholder that has submitted proposals for changes to the content of the register
containedItem	(role) ServiceOntologyRegisterItem	1..*	Register	item held in the service ontology register
containedItemClass	(role) ServiceOntologyItemClass	1	Register	item class that describes the characteristics of the class of items held in the service ontology register
name	(attribute) Character-String	1	RE_Register	human-readable designator that uniquely denotes the register within the set of registers maintained by the register owner NOTE This attribute is equal to the attribute <i>identifier</i> .
contentSummary	(attribute) Character-String	1	RE_Register	general statement of the purpose for which items in the register are made available to users
uniformResourceIdentifier	(attribute) URI	1..*	RE_Register	information about online resources associated with the register
operatingLanguage	(attribute) RE_Locale	1	RE_Register	primary language, country information and character encoding for the proper interpretation of the content of character strings in the register
alternativeLanguages	(attribute) Set<RE_Locale>	0..1	RE_Register	additional languages used in the register by item alternative expressions and item class alternative names other than the register operating language
citation	(role) RE_ReferenceSource	0..*	RE_Register	reference source that describes the sources (documents or registers) from which items in the register have been taken

6.4 Service ontology register item class

6.4.1 Introduction

The class `ServiceOntologyRegisterItemClass` (Figure 3) specifies information about the class of items contained in the register.

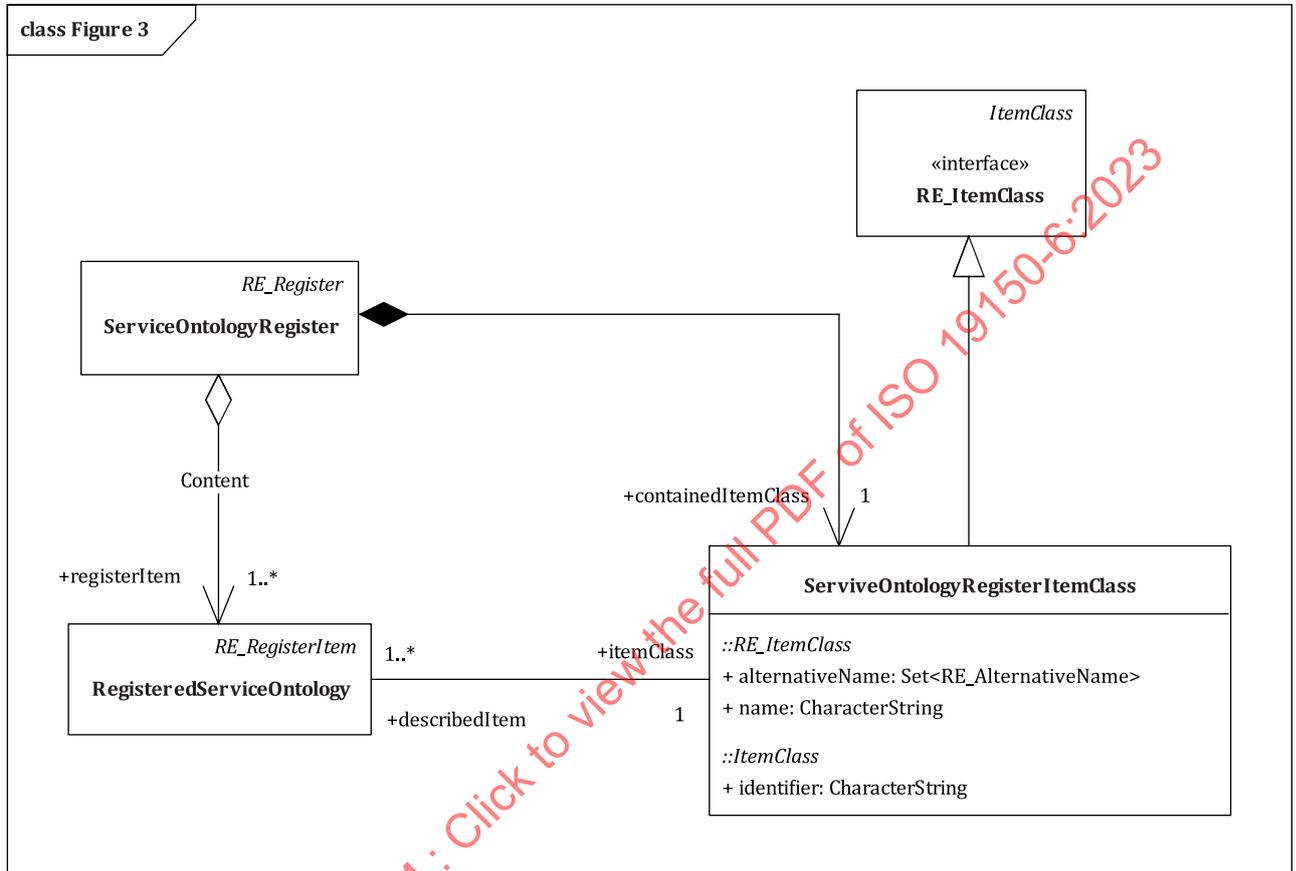


Figure 3 — `ServiceOntologyRegisterItemClass` class

6.4.2 Requirements

Table 4 lists the requirements for `ServiceOntologyRegisterItemClass`.

Table 4 — `ServiceOntologyRegisterItemClass` requirement

Requirement
19150-6ServiceOntologyRegister:ServiceOntologyRegisterItemClass
ServiceOntologyRegisterItemClass is a subclass of RE_ItemClass, specified in ISO 19135-1:2015, B.2.4, and shall inherit all its properties (i.e. attributes and roles). They are further described in 6.4.3.

6.4.3 Properties

Table 5 describes the `ServiceOntologyRegisterItemClass` properties.

`ServiceOntologyRegisterItemClass` is a subclass of `RE_ItemClass`, specified in ISO 19135-1:2015, B.2.4. It inherits three attributes and two association roles from `RE_ItemClass` and `ItemClass` (Table 5).

Table 5 — ServiceOntologyRegisterItemClass properties

Name	Type	Multiplicity	Inheritance	Definition
identifiter	(attribute) Character-String	1	ItemClass	human-readable designator that denotes a service ontology register item class NOTE This attribute is equal to the attribute <i>name</i> .
describedItem	(role) ServiceOntologyRegisteredItem	1..*	ItemClass	registered service ontology of the service ontology item class
name	(attribute) Character-String	1	RE_ItemClass	human-readable designator that denotes a service ontology item class NOTE This attribute is equal to the attribute <i>identifier</i> .
alternativeName	(attribute) Set<RE_Alternative-Name>	1	RE_ItemClass	set of expressions that translate the item class name and identifier into register-identified alternative languages
technicalStandard	(role) CI_Citation	1	RE_ItemClass	technical standard (and the specific portion thereof) to which registered service ontologies of the item class shall conform

6.5 Registered service ontology

6.5.1 Introduction

The class RegisteredServiceOntology ([Figure 4](#)) specifies information about the class of items contained in the register.

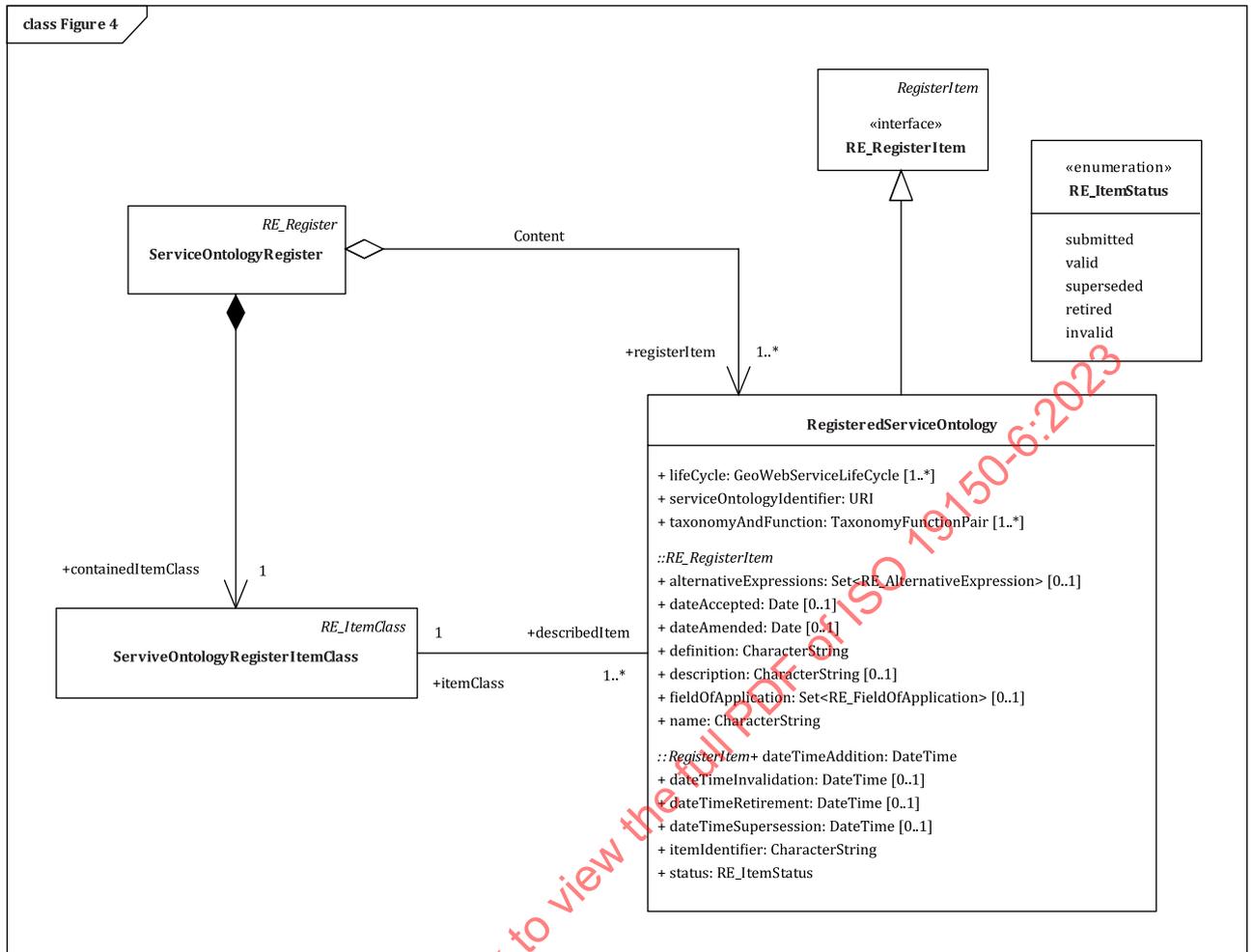


Figure 4 — RegisteredServiceOntology class

6.5.2 Requirements

Table 6 lists the requirements for RegisteredServiceOntology.

Table 6 — RegisteredServiceOntology requirement

Requirement
19150-6ServiceOntologyRegister:RegisteredServiceOntology
RegisteredServiceOntology is a subclass of RE_RegisterItem, specified in ISO 19135-1:2015, B.2.3, and shall inherit all its properties (i.e. attributes and roles).
Additionally, RegisteredServiceOntology shall have the following attributes:
— serviceOntologyIdentifier;
— taxonomyAndFunction;
— lifeCycle.
All properties are further described in 6.5.3.

6.5.3 Properties

Table 7 describes the RegisteredServiceOntology properties.

RegisteredServiceOntology is a subclass of RE_RegisterItem, specified in ISO 19135-1:2015, B.2.3. It inherits thirteen attributes and height association roles from RE_RegisterItem, and RegisterItem (Table 7) in addition to the three class attributes.

Table 7 — RegisteredServiceOntology properties

Name	Type	Multiplicity	Inheritance	Definition
itemIdentifier	(attribute) Character-String	1	RegisterItem	character string that uniquely denotes this registered service ontology within an item class and in the service ontology register
status	(attribute) RE_ItemStatus	1	RegisterItem	identification of the registration status of this registered service ontology
dateTimeAddition	(attribute) DateTime	1	RegisterItem	date and time when the registered service ontology is added
dateTimeSupersession	(attribute) DateTime	0..1	RegisterItem	date and time when the registered service ontology is superseded
dateTimeRetirement	(attribute) DateTime	0..1	RegisterItem	date and time when the registered service ontology is retired
dateTimeInvalidation	(attribute) DateTime	0..1	RegisterItem	date and time when the registered service ontology is invalidated
predecessor	(role) ServiceOntologyRegisteredItem	0..*	RegisterItem	register item replaced by this registered service ontology in the register
successor	(role) ServiceOntologyRegisteredItem	0..*	RegisterItem	register item replacing this registered service ontology in the register
itemClass	(role) ServiceOntologyItemClass	1	RegisterItem	connects this registered service ontology to its service ontology register item class
name	(attribute) Character-String	1	RE_RegisterItem	name identifying the GeoWeb service that is being referenced by this registered service ontology
definition	(attribute) Character-String	1	RE_RegisterItem	precise statement of the GeoWeb service (service offers, service requirements nature, properties, scope, or essential qualities of the service) referenced by this registered service ontology
alternativeExpressions	(attribute) Set<RE_AlternativeExpression>	0..1	RE_RegisterItem	alternate names and optionally additional information about this registered service ontology, each in a language other than the operating language of the service ontology register
dateAccepted	(attribute) Date	0..1	RE_RegisterItem	date on which a proposal to add a GeoWeb service ontology as a registered service ontology to the register is accepted
dateAmended	(attribute) Date	0..1	RE_RegisterItem	date on which a proposal to supersede or to retire this registered service ontology is accepted

Table 7 (continued)

Name	Type	Multiplicity	Inheritance	Definition
description	(attribute) Character-String	0..1	RE_Register-Item	brief summary of the GeoWeb service, such as service offers, service requirements, nature, properties, scope, or non-essential qualities of the service, that is referenced by this registered service ontology
fieldOfApplication	(attribute) Set<RE_FieldOfApplication>	0..1	RE_Register-Item	descriptions of the kinds of use of the GeoWeb service referenced by this registered service ontology
additionInformation	(role) RE_Addition-Information	1..*	RE_Register-Item	any supplementary information about this registered service ontology
amendmentInformation	(role) RE_Amendment-Information	0..*	RE_Register-Item	information about the process of amending this registered service ontology
clarificationInformation	(role) RE_Clarification-Information	0..*	RE_Register-Item	information about the process of clarifying this registered service ontology
specificationLineage	(role) RE_Reference	0..*	RE_Register-Item	information about the development of this registered service ontology specification
specificationSource	(role) RE_Reference	0..1	RE_Register-Item	identification of the source of this registered service ontology
serviceOntologyIdentifier	(attribute) URI	1		unambiguous reference of the GeoWeb service ontology being referenced by this registered service ontology
taxonomyAndFunction	(attribute) TaxonomyAndFunctionPair	1..*		pair of taxonomy and function(s) values of the GeoWeb service being referenced by this registered service ontology
lifeCycle	(attribute) GeoWebServiceLifeCycle	1..*		usage-oriented life cycle perspective description of the GeoWeb service being referenced by this registered service ontology

7 Register implementation

7.1 General

ISO 19135-1 specifies procedures for managing a register of items of geographic information, as well as a set of content elements common to all such registers. As shown in [Table 3](#), these include a number of elements of management information. A service ontology register is an instance of RE_Register (ISO 19135-1). According to ISO 19135-1, all of the registered items contained in a register belong to item classes, each of which is described by an instance of RE_ItemClass.

This document specifies the elements of a service ontology register which is based on ISO 19135-1. The classes defined in this document are all subclasses of ISO 19135-1 classes. However, all registered service ontologies (i.e. the register items) shall belong to the same and unique ServiceOntologyRegisterItemClass instance. Therefore, this clause specifies that instance of ServiceOntologyRegisterItemClass.

The requirements for the implementation of a service ontology register have one requirement class, identified as <https://standards.iso.org/iso/19150-6/1/req/ServiceOntologyRegisterImplementation/> (i.e. 19150-6ServiceOntologyRegisterImplementation) and are listed in [Table 8](#).

Table 8 — Requirements class for ServiceOntologyRegisterImplementation

Requirements class	
19150-6ServiceOntologyRegisterImplementation = https://standards.iso.org/iso/19150-6/1/req/ServiceOntologyRegisterImplementation/	
Target type	Service ontology register implementation
Dependency	https://standards.iso.org/iso/19103/ed-2/en/ (Conceptual schema language)
Dependency	https://standards.iso.org/iso/19135-1/ed-2/en/ (Procedures for item registration – Fundamentals)
Requirement	19150-6ServiceOntologyRegisterImplementation:ServiceOntologyRegisterIC

7.2 Item Class for registered service ontology

The requirements for registered service ontology item class are listed in [Table 9](#).

Table 9 — Registered service ontology item class requirement

Requirement
19150-6ServiceOntologyRegisterImplementation:ServiceOntologyRegisterIC
<p>The item class for registered service ontologies shall be an instance of ServiceOntologyRegisterItemClass, a subclass of RE_ItemClass (ISO 19135-1:2015, B.2.4), that shall be assigned the following attribute values.</p> <p>The value of the attribute <i>identifier</i> shall be “GeoWebServiceOntology”.</p> <p>The value of the attribute <i>name</i> shall be “GeoWebServiceOntology”.</p> <p>The value of the attribute <i>alternativeName</i> shall be:</p> <ol style="list-style-type: none"> a) <i>name</i> = "OntologieServiceGeoWeb" b) <i>locale</i>: <ol style="list-style-type: none"> 1) <i>name</i> = "Français" 2) <i>country</i> = "" 3) <i>language</i> = "fra" 4) <i>characterEncoding</i> = "" 5) <i>citation</i> <ol style="list-style-type: none"> i) <i>title</i> = "Français" <p>The value of the attribute <i>technicalStandard</i> shall be:</p> <ol style="list-style-type: none"> a) <i>title</i> = “ISO 19150-4, Geographic information — Ontology — Part 4: Service ontology”; b) <i>alternateTitle</i> = “ISO 19150-4”; c) <i>date</i>: <ol style="list-style-type: none"> 1) <i>date</i> = 2019-05; 2) <i>dateType</i> = “publication”. d) <i>edition</i> = “1” e) <i>onlineResource</i>: <ol style="list-style-type: none"> 1) <i>linkage</i> = “https://www.iso.org/standard/72177.html”

8 Service ontology register management

8.1 General

The management of a service ontology register follows ISO 19135-1:2015, Clause 5. It involves multiple roles that are illustrated in Figure 5. A single organization may play more than one role. Table 10 lists the requirements for the management of a service ontology register.

Any proposal submitted for consideration to a service ontology register shall contain the information identified in ISO 19135-1:2015, Annex E, which specifies the information necessary to submit a proposal to the manager of a service ontology register.

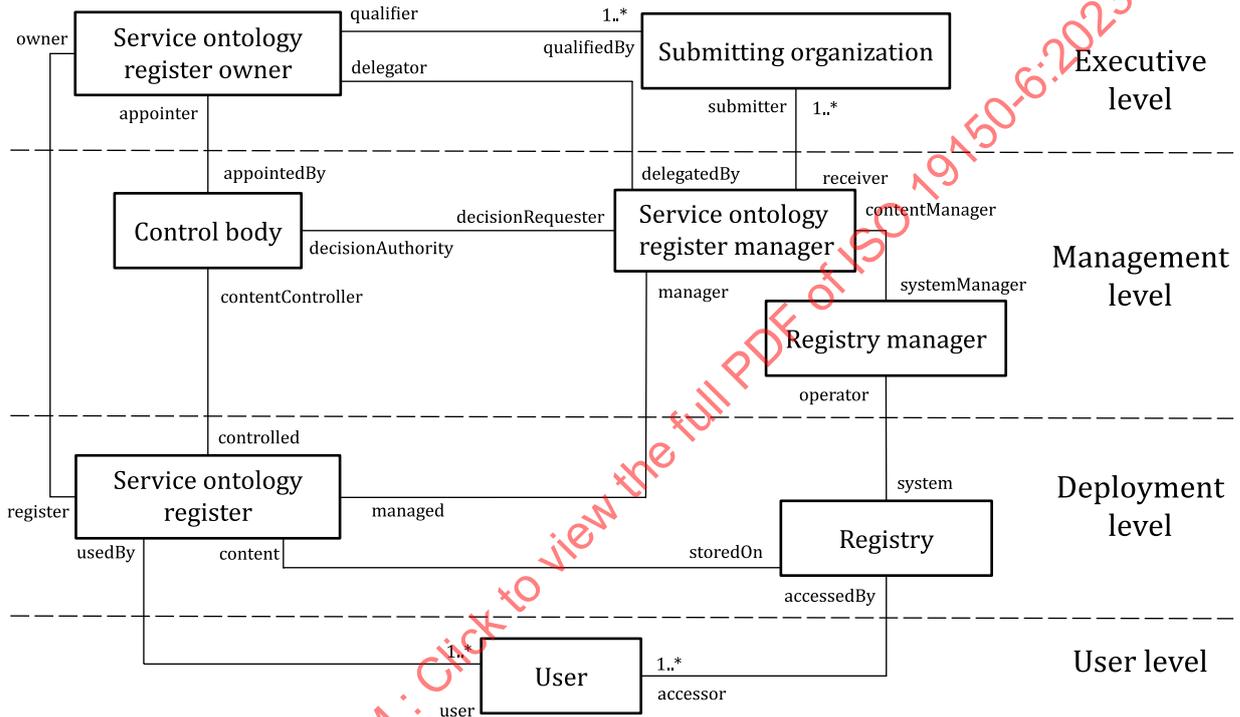


Figure 5 — Roles for the management of a service ontology register

The requirements for the management of a service ontology register have one requirement class, identified as <https://standards.iso.org/iso/19150-6/1/req/ServiceOntologyRegisterManagement/> (i.e. 19150-6ServiceOntologyRegisterManagement) and are listed in Table 10.

Table 10 — Requirements class for the register management

Requirements class	
19150-6ServiceOntologyRegisterManagement = https://standards.iso.org/iso/19150-6/1/req/ServiceOntologyRegisterManagement/	
Target type	Service ontology register management
Dependency	https://standards.iso.org/iso/19135-1/ed-2/en/ (Procedures for item registration – Fundamentals)
Requirement	19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterOwner
Requirement	19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterManager
Requirement	19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterSubmittingOrganization
Requirement	19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterControlBody
Requirement	19150-6ServiceOntologyRegisterManagement:RegistryManager

Table 10 (continued)

Requirements class	
Requirement	19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterUser
Requirement	19150-6ServiceOntologyRegisterManagement:ISOServiceOntologyRegister
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyStatus
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyAddition
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyClarification
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyInvalidation
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyRetirement
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologySuccession
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyProposals
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyApproval
Requirement	19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyPublication

8.2 Roles and responsibilities

8.2.1 Service ontology register owner

The register owner is the organization that establishes the service ontology register. It has the whole responsibility of the register, including its management, the content intellectual property, the dissemination, the access and the security. Although it remains responsible for the register, an organization may delegate activities required for maintaining the register. [Table 11](#) sets out the requirements for the service ontology register owner.

Table 11 — ServiceOntologyRegisterOwner requirement

Requirement
19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterOwner
The service ontology register owner shall conform to all requirements identified in ISO 19135-1:2015, 5.2.

8.2.2 Service ontology register manager

The service ontology register manager is the delegated organization from the service ontology register owner for performing the required management activities for the service ontology register. [Table 12](#) sets out the requirements for the service ontology register manager.

Table 12 — ServiceOntologyRegisterManager requirement

Requirement
19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterManager
The service ontology register manager shall comply with all requirements identified in ISO 19135-1:2015, 5.3.

8.2.3 Submitting organization

A submitting organization is an organization qualified to propose changes to the service ontology register. Only the service ontology register owner can qualify a submitting organization. [Table 13](#) sets out the requirements for the service ontology register submitting organization.

Table 13 — ServiceOntologyRegisterSubmittingOrganization requirement

Requirement
19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterSubmittingOrganization
A submitting organization shall follow ISO 19135-1:2015, Annex E, "Information to be included in proposals for item registration," when submitting a proposal for the service ontology register.

8.2.4 Control body

A control body is one expert or a group of experts who decide about the acceptability or unacceptability of a proposal. The control body for the service ontology register is tasked to validate the conformance of the GeoWeb service ontology to ISO 19150-4 (structure and content) and the content of the proposal for its processing into the service ontology register. [Table 14](#) sets out the requirements for the service ontology register control body.

Table 14 — ServiceOntologyRegisterControlBody requirement

Requirement
19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterControlBody
The service ontology register control body shall conform to all requirements identified in ISO 19135-1:2015, 5.5.

8.2.5 Registry manager

A registry manager is an organization or an individual responsible for the development, maintenance and operation of the information system that maintains the service ontology register. [Table 15](#) sets the requirements for the service ontology registry manager.

Table 15 — RegistryManager requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegistryManager
The registry manager shall conform to all requirements identified in ISO 19135-1:2015, 5.6.

8.2.6 User

A user of the register is an individual or an organization who wants to find a GeoWeb service that would accomplish a capability in which it has interest. The service ontology register constitutes a resource that is specifically oriented for this purpose. [Table 16](#) sets out the requirements for the service ontology register user.

The service ontology register manager defines user access levels that may be granted to users.

Table 16 — ServiceOntologyRegisterUser requirement

Requirement
19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterUser
The service ontology register manager shall conform to all requirements identified in ISO 19135-1:2015, 5.7.

8.3 Managing a service ontology register

8.3.1 Establishing a service ontology register

Any organization maintaining a spatial data infrastructure offering geographic information services on the Web and the Semantic Web may establish a service ontology register to support the search and discovery of GeoWeb services via their ontological description in OWL in accordance with ISO 19150-4. [Table 17](#) sets out the requirements for ISO service ontology register.

Table 17 — ISO service ontology register requirement

Requirement
19150-6ServiceOntologyRegisterManagement:ISOServiceOntologyRegister
If an ISO Technical Committee/Subcommittee establishes a service ontology register, the service ontology register shall follow the requirements specified in Reference [6] in addition to those specified in ISO 19135-1 and in this document.

NOTE See the ISO/IEC Directives, Part 1:2021, 2.12 and Annex H.

ISO 19135-1:2015, Requirement 13, is met by [Clause 7](#) of this document.

8.3.2 Status of a service ontology register item

A registered service ontology becomes *valid* at the time it is accepted in the register until the time when its status changes to *superseded*, *retired* or *invalid*. Items from any status remain recorded in the service ontology register. [Table 18](#) specifies the requirement.

Table 18 — Registered service ontology status requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyStatus
A registered service ontology shall be individually managed, moving through a set of well-defined states. Information about the temporal history of each registered service ontology shall be maintained.
NOTE See ISO 19135-1:2015, Requirement 14.

A new registered service ontology inserted in the service ontology register is an addition. [Table 19](#) specifies the requirement.

Table 19 — Registered service ontology addition requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyAddition
When a new registered service ontology is added, the date when this occurred shall be recorded as <i>dateTime-Addition</i> and <i>dateAccepted</i> . Its status shall be recorded as "valid."

The correction of errors in spelling, punctuation or grammar in a registered service ontology creates a clarification of it. [Table 20](#) specifies the requirement.

Table 20 — Registered service ontology clarification requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyClarification
A clarification shall not cause any substantive semantic or technical change to a registered service ontology. It is accomplished by updating the appropriate element of the registered service ontology. A justification and the date when the modification was accepted shall be recorded in <i>clarificationInformation</i> .
NOTE See ISO 19135-1:2015, Requirements 16 and 17.

When a substantive error is found in a registered service ontology, it shall be invalidated and replaced by a valid registered service ontology. [Table 21](#) specifies the requirement.

Table 21 — Registered service ontology invalidation requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyInvalidation
A registered service ontology that shows substantive error shall be left in the register but have its <i>status</i> changed to "invalid." The time when its status was changed shall be recorded in <i>dateTimeInvalidation</i> and <i>dateAmended</i> .
A new registered service ontology shall replace the invalidated one. The new registered service ontology shall be identified as the <i>successor</i> of the invalid registered service ontology and the invalid registered service ontology shall be identified as the <i>predecessor</i> of the new registered service ontology.
NOTE See ISO 19135-1:2015, Requirement 18.

When a registered service ontology is no longer of use, a submitting organization may request its retirement. [Table 22](#) specifies the requirement.

Table 22 — Registered service ontology retirement requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyRetirement
A registered service ontology shall be retired from the service ontology register by changing its status to "retired." The time when its status was changed shall be recorded in <i>dateTimeRetirement</i> and <i>dateAmended</i> .
NOTE See ISO 19135-1:2015, Requirement 19.

GeoWeb services represented by a registered service ontology may evolve over time. A new registered service ontology may supersede an existing one. The succession of registered service ontology along with their time period of validity will show the progress of a GeoWeb service. [Table 23](#) specifies the requirement.

Table 23 — Registered service ontology succession requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologySuccession
When a new registered service ontology supersedes an existing one, the date when this occurred shall be recorded as <i>dateTimeSupersession</i> and <i>dateAmended</i> in the superseded registered service ontology and as <i>dateTimeAddition</i> and <i>dateAccepted</i> in the new registered service ontology. Their status shall be modified accordingly. The new registered service ontology shall be identified as <i>successor</i> of the superseded registered service ontology and the superseded registered service ontology shall be identified as the <i>predecessor</i> of the new registered service ontology. Only the most recent registered service ontology shall be recorded as "valid" in the succession of registered service ontologies.
NOTE See ISO 19135-1:2015, Requirements 15 and 20.

8.3.3 Process of proposal to the service ontology register

Proposals come from submitting organizations. Submitting organizations are responsible for:

- a) completeness of proposals;

NOTE 1 ISO 19135-1:2015, Annex E provides information to be included in proposals.
- b) coordination with other submitting organizations, as appropriate;
- c) transmission of proposals to the register manager; and
- d) provision of any additional information, as required.

The service ontology register manager is responsible for:

- reception of proposals from submitting organizations;

NOTE 2 A submitting organization is required to be qualified by the service ontology register owner.

- the proposal review;

NOTE 3 An incomplete proposal is returned to the submitting organizations.

- initiation of the approval process; and
- generation of a proposal management record, as necessary.

Tables 24 and 25 specify the requirements for the review and approval of proposals.

Table 24 — Registered service ontology proposals requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyProposals
A proposal submitted for consideration to a service ontology register shall contain the information identified in ISO 19135-1:2015, Annex E.
The service ontology register manager shall review proposals received from submitting organizations for completeness and return proposals if incomplete or if the submitting organization is not qualified, or else initiate the approval process.
NOTE See ISO 19135-1:2015, Requirement 21.

Table 25 — Registered service ontology approval requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyApproval
The control body shall take a decision for approval or not in the time period specified by the service ontology register owner.
NOTE See ISO 19135-1:2015, Requirement 22.

8.3.4 Publication of the service ontology register

The registry manager is responsible for the publication of the register on the Web. Table 26 specifies the requirements for the publication of a registered service ontology.

Table 26 — Registered service ontology publication requirement

Requirement
19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyPublication
The registry manager shall ensure that information about valid, invalidated, superseded or retired items in the service ontology register is readily available to users.
NOTE See ISO 19135-1:2015, Requirement 23.

Annex A (normative)

Abstract test suite

A.1 Conformance classes

[Annex A](#) describes tests corresponding to each requirement. They are packaged into three conformance classes:

- 1) Conformance class for the identification and description of a service ontology register:
 - 19150-6ServiceOntologyRegister-conf = <http://standards.iso211.org/iso19150/-6/1/conf/ServiceOntologyRegister/>
- 2) Conformance class for the implementation of a service ontology register:
 - 19150-6ServiceOntologyRegisterImplementation-conf = <https://standards.iso211.org/iso19150/-6/1/conf/ServiceOntologyRegisterImplementation/>
- 3) Conformance class for the management of a service ontology register:
 - 19150-6ServiceOntologyRegisterManagement-conf = <https://standards.iso211.org/iso19150/-6/1/conf/ServiceOntologyRegisterManagement/>

The conformance class "identification and description of a service ontology register" (19150-6ServiceOntologyRegister-conf) includes the following tests:

- service ontology register (see [A.2.1](#));
- service ontology register item class (see [A.2.2](#));
- registered service ontology (see [A.2.3](#)).

The conformance class "implementation of a service ontology register" (19150-6ServiceOntologyRegisterImplementation-conf) includes the following test:

- implementation of a service ontology register (see [A.3.1](#)).

The conformance class "management of a service ontology register" (19150-6ServiceOntologyRegisterManagement-conf) includes the following tests:

- service ontology register owner (see [A.4.1](#));
- service ontology register manager (see [A.4.2](#));
- service ontology register submitting organization (see [A.4.3](#));
- service ontology register control body (see [A.4.4](#));
- registry manager (see [A.4.5](#));
- service ontology register user (see [A.4.6](#));
- ISO service ontology register (see [A.4.7](#));
- registered service ontology status (see [A.4.8](#));

- registered service ontology addition (see [A.4.9](#));
- registered service ontology clarification (see [A.4.10](#));
- registered service ontology invalidation (see [A.4.11](#));
- registered service ontology retirement (see [A.4.12](#));
- registered service ontology succession (see [A.4.13](#));
- registered service ontology proposals (see [A.4.14](#));
- registered service ontology approval (see [A.4.15](#));
- registered service ontology publication (see [A.4.16](#)).

A.2 Identification and description of a service ontology register

A.2.1 Service ontology register

The test 19150-6ServiceOntologyRegister-conf:ServiceOntologyRegister for "Service ontology register" is as follows:

- a) Test purpose: Verify that the implementation of the service ontology register contains a class corresponding to the class ServiceOntologyRegister. Verify that the class is a subclass of RE_Register (ISO 19135-1:2015, B.2.2) and inherits all its properties in accordance with [Table 3](#).
- b) Test method: Inspect the implementation of the service ontology register and more specifically the container (e.g. structure, class, etc.) corresponding to the class ServiceOntologyRegister. Inspect if the properties are set appropriately.
- c) Reference: Requirement 19150-6ServiceOntologyRegister:ServiceOntologyRegister ([6.3.2](#)).
- d) Test type: Capability test.

A.2.2 Service ontology register item class

The test 19150-6ServiceOntologyRegister-conf:ServiceOntologyRegisterItemClass for "Service ontology register item class" is as follows:

- a) Test purpose: Verify that the implementation of the service ontology register contains a class corresponding to the class ServiceOntologyRegisterItemClass. Verify that the class is a subclass of RE_ItemClass (ISO 19135-1:2015, B.2.4) and inherits all its properties in accordance with [Table 5](#).
- b) Test method: Inspect the implementation of the service ontology register and more specifically the container (e.g. structure, class, etc.) corresponding to the class ServiceOntologyRegisterItemClass. Inspect if the properties are set appropriately.
- c) Reference: Requirement 19150-6ServiceOntologyRegister:ServiceOntologyRegisterItemClass ([6.4.2](#)).
- d) Test type: Capability test.

A.2.3 Registered service ontology

The test 19150-6ServiceOntologyRegister-conf:RegisteredServiceOntology for "Registered service ontology" is as follows:

- a) Test purpose: Verify that the implementation of the service ontology register contains a class corresponding to the class RegisteredServiceOntology. Verify that the class is a subclass of RE_RegisterItem (ISO 19135-1:2015, B.2.3), that it inherits all its properties, and includes the additional properties serviceOntologyIdentifier, taxonomyAndFunction, and lifecycle in accordance with [Table 7](#).
- b) Test method: Inspect the implementation of the service ontology register and more specifically the container (e.g. structure, class, etc.) corresponding to the class RegisteredServiceOntology. Inspect if the properties are set appropriately.
- c) Reference: Requirement 19150-6ServiceOntologyRegister:RegisteredServiceOntology ([6.5.2](#)).
- d) Test type: Capability test.

A.3 Implementation of a service ontology register

A.3.1 Service ontology register item class

The test 19150-6ServiceOntologyRegisterImplementation-conf:ServiceOntologyRegisterIC for "Service ontology register item class" is as follows:

- a) Test purpose: Verify that the implementation of a service ontology register contains one and only one service ontology register item class for registered service ontology.

Verify that:

- the attribute *identifier* is set to "GeoWebServiceOntology"
- the attribute *name* is set to "GeoWebServiceOntology"
- the attribute *alternativeName* is set as follows:
 - *name* = "Français"
 - *country* = ""
 - *language* = "fra"
 - *characterEncoding* = ""
 - *citation*
 - *title* = "Français"
- the attribute *TechnicalStandard* is set as follows:
 - *title* = "ISO 19150-4, Geographic information — Ontology — Part 4: Service ontology"
 - *alternateTitle* = "ISO 19150-4"
 - *date*
 - *date* = "2019-05"
 - *dateType* = "publication"
 - *edition* = "1"

— *onlineResource*

— *linkage* = "<https://www.iso.org/standard/72177.html>"

All in accordance with [Table 9](#).

- b) Test method: Inspect the implementation of the service ontology register and more specifically the container (e.g. structure, class, etc.) corresponding to the item class for service ontology register item class. Inspect if the attributes are set appropriately.
- c) Reference: Requirement 19150-6ServiceOntologyRegister:ServiceOntologyRegisterIC ([7.2](#)).
- d) Test type: Capability test.

A.4 Management of a service ontology register

A.4.1 Service ontology register owner

The test 19150-6ServiceOntologyRegisterManagement-conf:ServiceOntologyRegisterOwner for "Service ontology register owner" is as follows:

- a) Test purpose: Verify that the service ontology register owner fulfils all the requirements of ISO 19135-1:2015, 5.2.
- b) Test method: Inspect the responsibilities of the register owner and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterOwner ([8.2.1](#)).
- d) Test type: Capability test.

A.4.2 Service ontology register manager

The test 19150-6ServiceOntologyRegisterManagement-conf:ServiceOntologyRegisterManager for "Service ontology register manager" is as follows:

- a) Test purpose: Verify that the service ontology register manager fulfils all the requirements of ISO 19135-1:2015, 5.3 and 5.7.
- b) Test method: Inspect the responsibilities of the register manager and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterManager ([8.2.2](#)); and Requirement 19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterUser ([8.2.6](#)).
- d) Test type: Capability test.

A.4.3 Service ontology register submitting organization

The test 19150-6ServiceOntologyRegisterManagement-conf:ServiceOntologyRegisterSubmittingOrganization for "Service ontology register submitting organization" is as follows:

- a) Test purpose: Verify that the proposals submitted by service ontology register submitting organizations fulfil the requirements of ISO 19135-1:2015, Annex E.
- b) Test method: Inspect the proposals submitted by service ontology register submitting organizations and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterSubmittingOrganization ([8.2.3](#)).
- d) Test type: Capability test.

A.4.4 Service ontology register control body

The test 19150-6ServiceOntologyRegisterManagement-conf:ServiceOntologyRegisterControlBody for "Service ontology register control body" is as follows:

- a) Test purpose: Verify that the service ontology register control body fulfils all the requirements of ISO 19135-1:2015, 5.5.
- b) Test method: Inspect the responsibilities of the control body and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:ServiceOntologyRegisterControlBody ([8.2.4](#)).
- d) Test type: Capability test.

A.4.5 Registry manager

The test 19150-6ServiceOntologyRegisterManagement-conf:RegistryManager for "Registry manager" is as follows:

- a) Test purpose: Verify that the service ontology registry manager fulfils all the requirements of ISO 19135-1:2015, 5.6.
- b) Test method: Inspect the responsibilities of the registry manager and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:RegistryManager ([8.2.5](#)).
- d) Test type: Capability test.

A.4.6 Register user

The test 19150-6ServiceOntologyRegisterManagement-conf:RegisterUser for "Register user" is as follows:

- a) Test purpose: Verify that the service ontology register manager fulfils all the requirements of ISO 19135-1:2015, 5.7.
- b) Test method: Inspect the responsibilities of the register manager and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:RegisterUser ([8.2.6](#)).
- d) Test type: Capability test.

A.4.7 ISO service ontology register

The test 19150-6ServiceOntologyRegisterManagement-conf:ISOServiceOntologyRegister for "ISO service ontology register" is as follows:

- a) Test purpose: Verify that the ISO service ontology register fulfils the requirements in specified in Reference [6] in addition to those specified in ISO 19135-1, and in this document.
- b) Test method: Inspect the ISO service ontology register and check if the requirements are met.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:ISOServiceOntologyRegister (8.3.1).
- d) Test type: Capability test.

A.4.8 Registered service ontology status

The test 19150-6ServiceOntologyRegisterManagement-conf:RegisteredServiceOntologyStatus for "Registered service ontology status" is as follows:

- a) Test purpose: Verify the registered service ontology and its attribute *status*; verify that the attribute *status* is set appropriately; verify the temporal attributes (*dateTimeAddition*, *dateTimeSupersession*, *dateTimeRetirement*, *dateTimeInvalidation*, *dateAccepted*, and *dateAmended*) and that they are set appropriately.
- b) Test method: Inspect the attributes *status*, *dateTimeAddition*, *dateTimeSupersession*, *dateTimeRetirement*, *dateTimeInvalidation*, *dateAccepted*, and *dateAmended* and check that they are set accordingly.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyStatus (8.3.2).
- d) Test type: Capability test.

A.4.9 Registered service ontology addition

The test 19150-6ServiceOntologyRegisterManagement-conf:RegisteredServiceOntologyAddition for "Registered service ontology addition" is as follows:

- a) Test purpose: Verify the registered service ontology; verify that the attribute *status* is set as "valid"; verify that the *dateTimeAddition* and *dateAccepted* attributes are set to the date at which it was added.
- b) Test method: Inspect the registered service ontology and its attributes *status*, *dateTimeAddition* and *dateAccepted*.
- c) Reference: Requirement 19150-6ServiceOntologyRegisterManagement:RegisteredServiceOntologyAddition (8.3.2).
- d) Test type: Capability test.

A.4.10 Registered service ontology clarification

The test 19150-6ServiceOntologyRegisterManagement-conf:RegisteredServiceOntologyClarification for "Registered service ontology clarification" is as follows: