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Geographic information — Ontology —

Part 6:
Service ontology register

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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 documents 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).

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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.*

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 could 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 and get accurate, detailed, and appropriate answers as people communicate between each other. This approach involves reasoning capabilities based on ontologies. The Semantic Web brings new opportunities for the geographic information realm to lay out a new generation of standards in order to benefit from these in achieving semantic interoperability of geographic information.

Fundamentally, ontology comes from philosophy and refers to the study of the nature of the world itself. The information technology and artificial intelligence communities borrowed the term ontology for the explicit specification of a conceptualization[4]. In 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 may 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 may exist. An ontology can be formalized differently ranging from weak to strong semantics: taxonomy, thesaurus, conceptual model, 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 their inherent semantics through the ontology associated with it. Ontologies can support integration of heterogeneous data captured by different communities by relating them based on their semantic similarity. The W3C has proposed the Web Ontology Language (OWL) family of knowledge representation languages for authoring ontologies characterised 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 facilitate 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, Geographic information - Ontology, Part 4: Service ontology sets 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. Therefore, this part of ISO 19150 sets a standard registration and maintenance mechanism for the registration of ISO 19150-4 compliant geographic information service ontologies which may serve to set up an international register of geographic information service ontologies.

ISO/PRF 19150-6
https://standards.iteh.ai/catalog/standards/sist/aa33e3d0-fdb6-4fe9-841e-3ff2765f1394/iso-
prf-19150-6

Geographic information — Ontology —

Part 6:
Service ontology register

1   Scope

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

Registered ontologies shall conform to ISO 19150-4 which sets the structure of geographic information Web service ontologies.

This document makes use of ISO 19135-1, Geographic information — Procedures for item registration — Part 1: Fundamentals whenever appropriate.

This part of ISO 19150 does not define semantics operators, 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 purpose 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 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.

This document is not intended to be an ISO Registration authority standard. However, it may be referenced by such a standard in the eventuality to create an ISO register.

NOTE 1   The purpose of this document is different of the ISO/IEC 19763 family of standards, *Information technology — Metamodel framework for interoperability (MFI)*, 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. However, registry based on this document could be described following 19763-6, *Information technology — Metamodel framework for interoperability (MFI) — Part 6: Registry Summary*.

NOTE 2   ISO/IEC 18384-3 defines a formal ontology for service-oriented architecture (SOA), an architectural style that supports service orientation. The terms defined in this ontology are key terms from the vocabulary in ISO/IEC 18384-1. This document does not provide any architectural style to support service orientation although GeoWeb service definitions may benefit from ISO/IEC 18384-3.

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 19115-1, *Geographic information — Metadata — Part 1: Fundamentals*

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

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

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 Terms and definitions

3.1.1
control body
<register> group of technical experts that makes decisions regarding the content of a *register* (3.1.6)

Note 1 to entry: the control body supports the *register manager* (3.1.7) for the review and approval of the register content.

Note 2 to entry: a control body is not necessary required for all *registers* (3.1.6)

[SOURCE: ISO 19135-1:2015, 4.1.2, modified - new note 1 and 2 has been added]

3.1.2
geographic information
information concerning phenomena implicitly or explicitly associated with a location relative to the Earth

[SOURCE: ISO 19101-1:2014, 4.1.18]

3.1.3
identifier
linguistically independent sequence of characters capable of uniquely and permanently identifying that with which it is associated

[SOURCE: ISO 19135-1:2015, 4.1.5]

3.1.4
item class
set of items with common properties

Note 1 to entry: Class is used in this context to refer to a set of instances, not the concept abstracted from that set of instances.

[SOURCE: ISO 19135-1:2015, 4.1.7]

3.1.5
ontology
formal representation of phenomena of a *universe of discourse* (3.1.13) with an underlying vocabulary including definitions and axioms that make the intended meaning explicit and describe phenomena and their interrelationships

[SOURCE: ISO 19101-1:2014, 4.1.26]

3.1.6
register
set of files containing *identifiers* (3.1.3) assigned to items with descriptions of the associated items

[SOURCE: ISO 19135-1:2015, 4.1.9]

3.1.7
register manager
organization to which management of a *register* (3.1.6) has been delegated by the *register owner* (3.1.8)

[SOURCE: ISO 19135-1:2015, 4.1.10, modified - Note 1 to entry has been removed]

3.1.8
register owner
organization that establishes a *register* (3.1.6)

[SOURCE: ISO 19135-1:2015, 4.1.11]

3.1.9
registration
assignment of a permanent, unique, and unambiguous *identifier* (3.1.3) to an item

[SOURCE: ISO 19135-1:2015, 4.1.12]

3.1.10
registry
information system on which a *register* (3.1.6) is maintained

[SOURCE: ISO 19135-1:2015, 4.1.13]

3.1.11
registry manager
person or organization responsible for the day-to-day management of a *registry* (3.1.10)

Note 1 to entry: In the case of an ISO register, the registry manager performs the functions of the registration authority specified in the ISO/IEC Directives, Part 1.

Note 2 to entry: The registry manager is responsible for the management of the information system.

3.1.12
service
distinct part of the functionality that is provided by an entity through interfaces

[SOURCE: ISO 19119:2016, 4.1.12]

3.1.13
submitting organization
organization authorized by a *register owner* (3.1.8) to propose changes to the content of a *register* (3.1.6)

[SOURCE: ISO 19135-1:2015, 4.1.15]

3.1.14
universe of discourse
view of the real or hypothetical world that includes everything of interest

[SOURCE: ISO 19101-1:2014, 4.1.38]

4   Abbreviated terms and namespaces

4.1   Abbreviated terms

OWL   Web Ontology Language

UML   Unified Modeling Language

URI   Universal Resource Identifier

W3C   World Wide Web Consortium

4.2   Namespaces

19150-6ServiceOntologyRegister

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

19150-6ServiceOntologyRegister-conf

> Conformance class for the identification and description of service ontology register
> http://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/ServiceOntologyReg isterImplementation/

19150-6ServiceOntologyRegisterImplementation-conf

> Conformance class for the implementation of a service ontology register
> https://standards.isotc211.org/iso19150/-6/1/conf/ServiceOntologyReg isterImplementation/

19150-6ServiceOntologyRegisterManagement

> Requirements class for the management of a service ontology register
> https://standards.isotc211.org/iso19150/-6/1/req/ServiceOntologyRegisterM anagement/

19150-6ServiceOntologyRegisterManagement-conf

> Conformance class for the management of a service ontology register
> https://standards.isotc211.org/iso19150/-6/1/conf/ServiceOntolog yRegisterManagement/

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 (i.e., 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. ISO 19150-4 standardized the description of GeoWeb Services.

A service ontology register aims to enable organizations that develop and maintain descriptions of GeoWeb service in compliance 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 complies with 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 UML 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 details in in clauses 6.3, 6.4, 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.isotc211.org/iso19150/-6/1/req/ServiceOntologyRegister/ (i.e., 19150-6ServiceOntologyRegister) and are listed in Table 1.
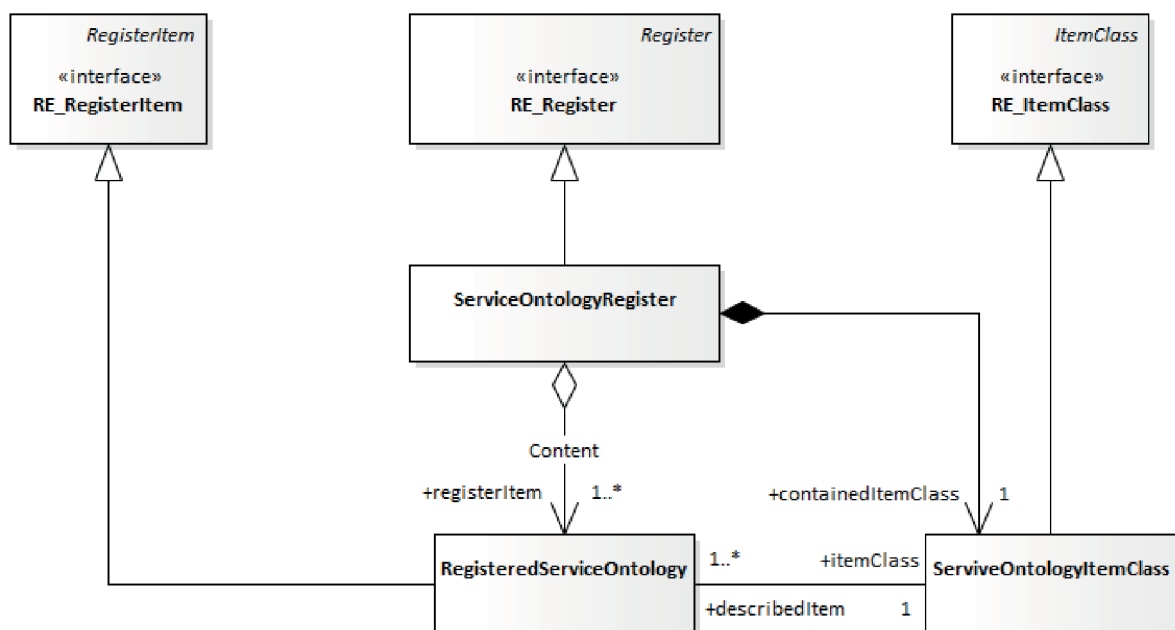

Figure 1 — Service ontology register fundamental class structure

Table 1 — Requirements class for ServiceOntologyRegister

Requirements class	
19150-6ServiceOntologyRegister = https://standards.isotc211.org/iso19150/-6/1/req/ServiceOntologyRegister/	
Target type	Service ontology register
Dependency	http://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

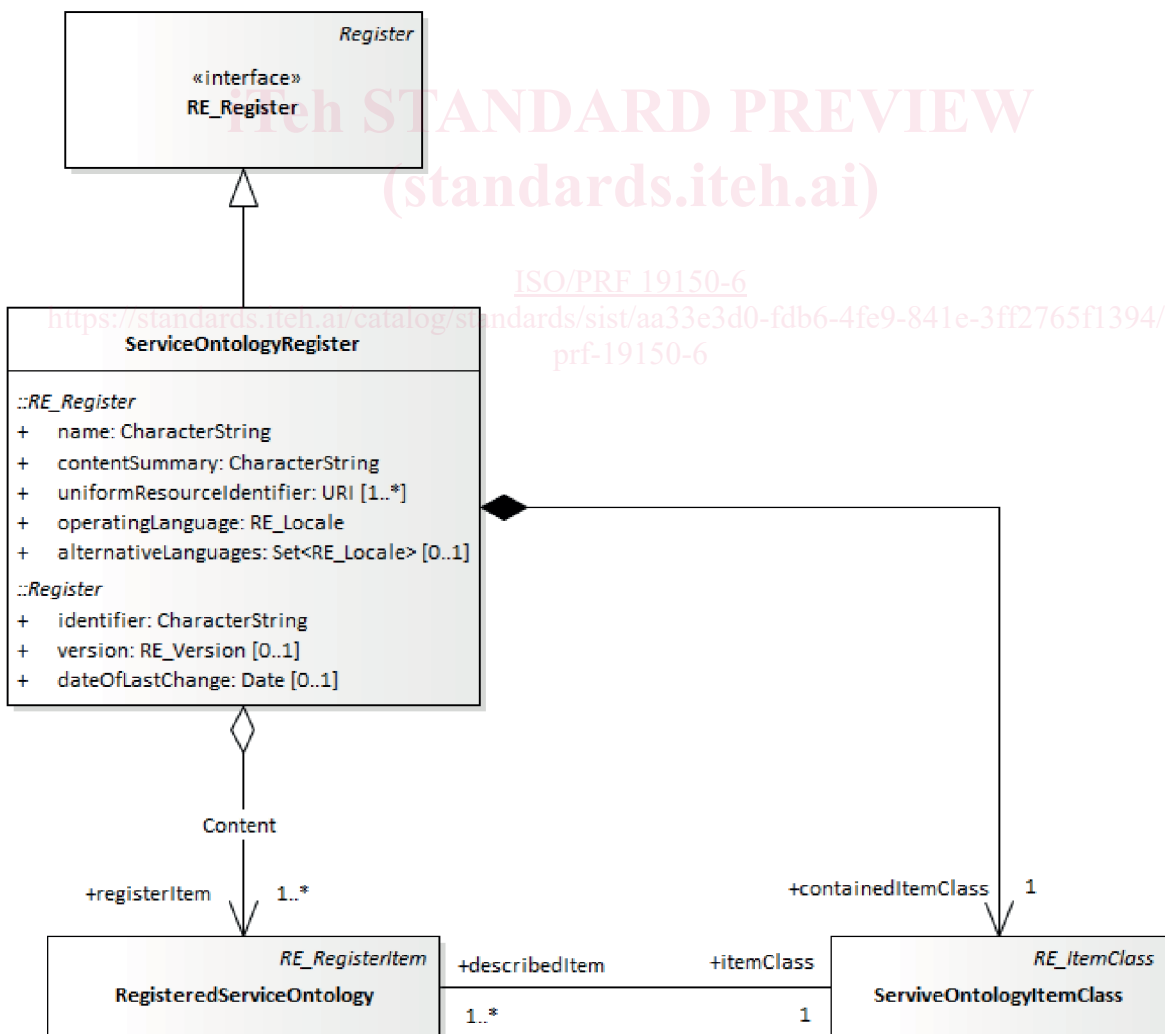The class ServiceOntologyRegister (Figure 2) specifies information about the register itself.

Figure 2 — ServiceOntologyRegister class