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ABSTRACT

<Insert Abstract Text here>



KEYWORDS

The following are keywords to be used by search engines and document catalogues.

keyword_1, keyword_2, keyword_3, etc.



PREFACE

NOTE: Insert Preface Text here. Give OGC specific commentary: describe the technical content, reason for document, history of the document and precursors, and plans for future work.

There are two ways to specify the Preface: “simple clause” or “full clause”

If the Preface does not contain subclauses, it is considered a simple preface clause. This one is entered as text after the `.Preface` label and must be placed between the AsciiDoc document attributes and the first AsciiDoc section title. It should not be give a section title of its own.

If the Preface contains subclauses, it needs to be encoded as a full preface clause. This one is recognized as a full Metanorma AsciiDoc section with the title “Preface”, i.e. `== Preface`. (Simple preface content can also be encoded like full preface.)



SECURITY CONSIDERATIONS

No security considerations have been made for this Standard.



SUBMITTERS

All questions regarding this submission should be directed to the editor or the submitters:

NAME	AFFILIATION	OGC MEMBER
Steve Liang	University of Calgary, Canada / SensorUp Inc.	Yes



SOURCE OF THE CONTENT FOR THIS OGC DOCUMENT



VALIDITY OF CONTENT



FUTURE WORK

NOTE:If you need to place any further sections in the preface area use the [.preface] attribute.



CONTRIBUTORS

Additional contributors to this Standard include the following:

Individual name(s), Organization



1

SCOPE



SCOPE

<Insert Scope text here>

NOTE: Give the subject of the document and the aspects of that scope covered by the document.



2

CONFORMANCE



CONFORMANCE

<Insert conformance content here>

NOTE: Provide a short description of the content approached in subsequent sections and the main subject of the document



3

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.

Identification of Common Molecular Subsequences. Smith, T.F., Waterman, M.S., J. Mol. Biol. 147, 195–197 (1981)

ZIB Structure Prediction Pipeline: Composing a Complex Biological Workflow through Web Services. May, P., Ehrlich, H.C., Steinke, T. In: Nagel, W.E., Walter, W.V., Lehner, W. (eds.) Euro-Par 2006. LNCS, vol. 4128, pp. 1148–1158. Springer, Heidelberg (2006)

The Grid: Blueprint for a New Computing Infrastructure., Foster, I., Kesselman, C.. Morgan Kaufmann, San Francisco (1999).

Grid Information Services for Distributed Resource Sharing. Czajkowski, K., Fitzgerald, S., Foster, I., Kesselman, C. In: 10th IEEE International Symposium on High Performance Distributed Computing, pp. 181–184. IEEE Press, New York (2001)



4

TERMS AND DEFINITIONS

This document uses the terms defined in OGC Policy Directive 49, which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this document and OGC documents do not use the equivalent phrases in the ISO/IEC Directives, Part 2.

This document also uses terms defined in the OGC Standard for Modular specifications (OGC 08-131r3), also known as the ‘ModSpec’. The definitions of terms such as standard, specification, requirement, and conformance test are provided in the ModSpec.

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

4.1. example term

term used for exemplary purposes

Note 1 to entry: An example note.

Example Here’s an example of an example term.

[SOURCE:]



5

CONVENTIONS

NOTE: This section provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

5.1. Identifiers

The normative provisions in this standard are denoted by the URI

<http://www.opengis.net/spec/{standard}/{m.n}>

All requirements and conformance tests that appear in this document are denoted by partial URIs which are relative to this base.

5.2. Other conventions

<Place any other convention needed with its corresponding title>



6

CORE

This clause establishes the **Core** Requirements class, with IRI `/req/core`, which has a corresponding Conformance Class, **Core**, with IRI `/conf/core`.

6.1. Class: `geosrs:CoordinateSystem`

The class `geosrs:geosrs:CoordinateSystem` is defined by the following:

Set of axes that spans a given coordinate space and of mathematical rules for specifying how coordinates are to be assigned to points. Cf. ISO 19111:2007:2007-07, part 9.2, table 17 and annex B.2.

6.2. Class: `geosrs:CartesianCoordinateSystem`

The class `geosrs:geosrs:CartesianCoordinateSystem` is defined by the following:

Coordinate system which gives the position of points relative to *n* mutually perpendicular axes. Cf. ISO 19111:2007:2007-07, tables 15 and 18.

6.3. Class: `geosrs:EllipsoidalCoordinateSystem`

The class `geosrs:geosrs:EllipsoidalCoordinateSystem` is defined by the following:

Coordinate system which gives the position is specified by geodetic latitude, geodetic longitude and (in the three-dimensional case) ellipsoidal height. Cf. ISO 19111:2007:2007-07, tables 15 and 20.

6.4. Class: `geosrs:LinearCoordinateSystem`

The class `geosrs:geosrs:LinearCoordinateSystem` is defined by the following:

One-dimensional coordinate system in which a linear feature forms the axis.

6.5. Class: geosrs:OrdinalCoordinateSystem

The class `geosrs:geosrs:OrdinalCoordinateSystem` is defined by the following:

n-dimensional coordinate system in which every axis uses integers.

6.6. Class: geosrs:ParametricCoordinateSystem

The class `geosrs:geosrs:ParametricCoordinateSystem` is defined by the following:

One-dimensional coordinate system where the axis units are parameter values which are not inherently spatial.

6.7. Class: geosrs:PolarCoordinateSystem

The class `geosrs:geosrs:PolarCoordinateSystem` is defined by the following:

Two-dimensional coordinate system in Euclidean space in which position is specified by one distance coordinate and one angular coordinate.

6.8. Class: geosrs:SphericalCoordinateSystem

The class `geosrs:geosrs:SphericalCoordinateSystem` is defined by the following:

Three-dimensional coordinate system in Euclidean space with one distance measured from the origin and two angular coordinates

6.9. Class: geosrs:VerticalCoordinateSystem

The class `geosrs:geosrs:VerticalCoordinateSystem` is defined by the following:

One-dimensional coordinate system used for gravity related height or depth measurements. Cf. ISO 19111:2007:2007-07, tables 15 and 25.

6.10. Class: geosrs:CoordinateSystemAxis

The class `geosrs:geosrs:CoordinateSystemAxis` is defined by the following:

Axis relative to which a coordinate of a point is specified in a coordinate system. See ISO 19111:2007:2007-07, part 9.3, table 27 and annex B.2.2.

6.11. Class: geosrs:AreaOfUse

The class `geosrs:geosrs:AreaOfUse` is defined by the following:

6.12. Class: geosrs:CRS

The class `geosrs:geosrs:CRS` is defined by the following:

Depending on the spatial dimension of coordinates (1D, 2D, 3D), this piece of metadata is used for specifying the elements of definition associated to a given set of coordinates: its datum, its ellipsoid, its prime meridian, the type of coordinates (geocentric, geographic, projected,...), the coordinates units of measure, when appropriate the cartographic projection used, the vertical coordinate reference system.

6.13. Class: geosrs:EngineeringCRS

The class `geosrs:geosrs:EngineeringCRS` is defined by the following:

6.14. Class: geosrs:GeodeticCRS

The class `geosrs:geosrs:GeodeticCRS` is defined by the following:

Coordinate reference system associated with a geodetic datum. Cf. ISO 19111:2007:2007-07, part 8.2.2.a, table 10 and annex B.1.2.1.a.

6.15. Class: geosrs:GeographicCRS

The class `geosrs:geosrs:GeographicCRS` is defined by the following:

6.16. Class: geosrs:ProjectedCRS

The class `geosrs:geosrs:ProjectedCRS` is defined by the following:

Coordinate reference system derived from a two-dimensional geodetic coordinate reference system by applying a map projection. Cf. ISO 19111:2007:2007-07, part 8.2.3.b, table 11 and annex B.1.2.3.

6.17. Class: geosrs:SingleCRS

The class `geosrs:geosrs:SingleCRS` is defined by the following:

Coordinate reference system consisting of one coordinate system and one datum. Cf. ISO 19111:2007:2007-07, table 5.

6.18. Class: geosrs:SpatialReferenceSystem

The class `geosrs:geosrs:SpatialReferenceSystem` is defined by the following:

A reference system allowing the description of a position.

6.19. Class: geosrs:CoordinateOperation

The class `geosrs:geosrs:CoordinateOperation` is defined by the following:

Mathematical operation on coordinates, based on one-to-one relationship, that changes coordinates from one coordinate reference system to another. Cf. ISO 19111:2007:2007-07, part 11.1, table 42 and annex B.4.

6.20. Class: geosrs:SingleOperation

The class `geosrs:geosrs:SingleOperation` is defined by the following:

A non concatenated coordinate operation. Cf. ISO 19111:2007:2007-07, table 43.

6.21. Class: geosrs:Transformation

The class `geosrs:geosrs:Transformation` is defined by the following:

Coordinate operation in which the two coordinate reference systems are based on different datums. Cf. ISO 19111:2007:2007-07, table 44.

6.22. Class: geosrs:Conversion

The class `geosrs:geosrs:Conversion` is defined by the following:

Coordinate operation in which both coordinate reference systems are based on the same datum. Cf. ISO 19111:2007:2007-07, table 45 and annex B.4.2.

6.23. Class: geosrs:OperationMethod

The class `geosrs:geosrs:OperationMethod` is defined by the following:

Method used to perform an operation on coordinates. See ISO 19111:2007:2007-07, table 48 and annex B.4.5.

6.24. Class: geosrs:OperationParameter

The class `geosrs:geosrs:OperationParameter` is defined by the following:

Parameter used by a method to perform an operation on coordinates. See ISO 19111:2007:2007-07, table 52 and annex B.4.5.

6.25. Class: geosrs:OperationParameterValue

The class `geosrs:geosrs:OperationParameterValue` is defined by the following:

Value of a parameter used by a method to perform an operation on coordinates. See ISO 19111:2007:2007-07, table 55.

6.26. Class: geosrs:Datum

The class `geosrs:geosrs:Datum` is defined by the following:

Parameter or set of parameters that define the position of the origin, the scale and the orientation of a coordinate system. Cf. ISO 19111:2007:2007-07, part 10.1, table 33 and annex B.3.

6.27. Class: geosrs:GeodeticDatum

The class `geosrs:geosrs:GeodeticDatum` is defined by the following:

Datum describing the relation of a two- or three-dimensional coordinate system to the Earth. Cf. ISO 19111:2007:2007-07, part 10.2, table 34 and annex B.3.2.

6.28. Class: geosrs:PrimeMeridian

The class `geosrs:geosrs:PrimeMeridian` is defined by the following:

Meridian from which the longitudes of other meridians are quantified. Cf. ISO 19111:2007:2007-07, part 10.2.1, table 35 and annex B.3.2.2.

6.29. Class: geosrs:Ellipsoid

The class `geosrs:geosrs:Ellipsoid` is defined by the following:

Surface formed by the rotation of an ellipse about its minor axis, defined by a semi-major axis and a flattening parameter and fairly geocentric. NB : It is a mathematical model of the geoid, i.e.

the Earth without its relief. Many geodetic ellipsoids exist. Cf. ISO 19111:2007:2007-07, part 10.2.2, table 36 and annex B.3.2.3.

6.30. Class: `geosrs:VerticalDatum`

The class `geosrs:geosrs:VerticalDatum` is defined by the following:

Datum describing the relation of gravity-related heights or depths to the Earth. Cf. ISO 19111:2007:2007-07, table 41 and annex B.3.3.

7

COORDINATE OPERATION MODULE



COORDINATE OPERATION MODULE

This clause establishes the **Co** Requirements class, with IRI /req/co, which has a corresponding Conformance Class, **Co**, with IRI /conf/co.



8

COORDINATE SYSTEM MODULE

This clause establishes the **CS** Requirements class, with IRI /req/cs, which has a corresponding Conformance Class, **CS**, with IRI /conf/cs.

9

DATUM MODULE



DATUM MODULE

This clause establishes the **Datum** Requirements class, with IRI /req/datum, which has a corresponding Conformance Class, **Datum**, with IRI /conf/datum.

10

SRS APPLICATION MODULE

This clause establishes the **SRSAPP** Requirements class, with IRI /req/srsapp, which has a corresponding Conformance Class, **SRSAPP**, with IRI /conf/srsapp.



11

PROJECTIONS MODULE

This clause establishes the **PROJ** Requirements class, with IRI /req/proj, which has a corresponding Conformance Class, **PROJ**, with IRI /conf/proj.



12

PLANET MODULE

This clause establishes the **PLANET** Requirements class, with IRI /req/planet, which has a corresponding Conformance Class, **PLANET**, with IRI /conf/planet.



ANNEX A (INFORMATIVE) ALIGNMENTS



ANNEX A

(INFORMATIVE)

ALIGNMENTS

Overview

Overview

The prefixes used for the ontologies mapped to in all following sections are given in the following table.

Table A.1 — Alignment: Namespaces

ign:	http://data.ign.fr/def/ignf#
iso19111:	http://def.isotc211.org/iso19112/2019/SpatialReferencingByGeographicIdentifier#
geosrs:	http://www.opengis.net/ont/geosparql#
ifc:	https://standards.buildingsmart.org/IFC/DEV/IFC4/ADD2_TC1/OWL/
owl:	http://www.w3.org/2002/07/owl#
prov:	http://www.w3.org/ns/prov#
rdf:	http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs:	http://www.w3.org/2000/01/rdf-schema#

A.1. IGN CRS Ontology

Table A.2 — Alignment: IGN CRS Ontology

FROM ELEMENT	MAPPING RELATION	TO ELEMENT	NOTES
geosrs:CoordinateSystem	<u>owl:equivalentClass</u>	<u>ign:CoordinateSystem</u>	-
geosrs:Datum	<u>owl:equivalentClass</u>	<u>ign:Datum</u>	-
geosrs:Ellipsoid	<u>owl:equivalentClass</u>	<u>ign:Ellipsoid</u>	-

A.2. ISO 19111 Ontology

Table A.3 — Alignment: ISO 19111 Ontology

FROM ELEMENT	MAPPING RELATION	TO ELEMENT	NOTES
geosrs:CoordinateSystem	<u>owl:equivalentClass</u>	<u>iso19111:CoordinateSystem</u>	-
geosrs:Datum	<u>owl:equivalentClass</u>	<u>iso19111:Datum</u>	-
geosrs:Ellipsoid	<u>owl:equivalentClass</u>	<u>iso19111:Ellipsoid</u>	-

A.3. IFCOWL Ontology

Table A.4 — Alignment: IFCOWL Ontology

FROM ELEMENT	MAPPING RELATION	TO ELEMENT	NOTES
geosrs:CRS	<u>owl:equivalentClass</u>	<u>ifc:CoordinateReferenceSystem</u>	-



ANNEX B (INFORMATIVE) SHACL SHAPES



ANNEX B (INFORMATIVE) SHACL SHAPES

Overview

Overview



ANNEX C (INFORMATIVE) REVISION HISTORY



ANNEX C (INFORMATIVE) REVISION HISTORY

DATE	RELEASE	AUTHOR	PRIMARY CLAUSES MODIFIED	DESCRIPTION
2016-04-28	0.1	G. Editor	all	initial version



BIBLIOGRAPHY





BIBLIOGRAPHY

NOTE: The TC has approved Springer LNCS as the official document citation type. Springer LNCS is widely used in technical and computer science journals and other publications. For citations in the text please use square brackets and consecutive numbers: [1], [2], [3]. Actual References: [n] Journal: Author Surname, A.: Title. Publication Title. Volume number, Issue number, Pages Used (Year Published)

- [1] ISO: ISO 19142, *Geographic information – Web Feature Service*. International Organization for Standardization, Geneva <https://www.iso.org/standard/42136.html>.
- [2] W3C: **Data Catalog Vocabulary**, W3C Recommendation 16 January 2014, <https://www.w3.org/TR/vocab-dcat/>
- [3] IANA: **Link Relation Types**, <https://www.iana.org/assignments/link-relations/link-relations.xml>
- [4] W3C/OGC: **Spatial Data on the Web Best Practices**, W3C Working Group Note 28 September 2017, <https://www.w3.org/TR/sdw-bp/>
- [5] W3C: **Data on the Web Best Practices**, W3C Recommendation 31 January 2017, <https://www.w3.org/TR/dwbp/>
- [6] Ben-Kiki, O., Evans, C., Ingy döt Net: **YAML Ain't Markup Language**, <https://yaml.org/>
- [7] OGC: **Web Feature Service 2.0**, <http://docs.openeospatial.org/is/09-025r2/09-025r2.html>
- [8] Berners-Lee, T., Fielding, R., Masinter, L.: **IETF RFC 3986 – Uniform Resource Identifier (URI): Generic Syntax**, <http://tools.ietf.org/rfc/rfc3986.txt>