Open Geospatial Consortium

Submission Date: <yyyy-mm-dd>

Approval Date: <yyyy-mm-dd>

Publication Date: 2021-12-17

External identifier of this OGC® document: http://www.opengis.net/doc/{doc-type}/{standard}/{m.n}

Internal reference number of this OGC® document: YY-nnnrx

Version: n.n

Category: OGC® Best Practice

Editor: <Name(s) of Editor or Editors>

OGC (add title text)

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Document type:	OGC® Best Practice
Document subtype:	
Document stage:	Draft
Document language:	English

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i. Abstract

<Insert Abstract Text here>

ii. Keywords

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

ogcdoc, OGC document, <tags separated by commas>

iii. 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. > Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

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iv. Submitting organizations

The following organizations submitted this Document to the Open Geospatial Consortium (OGC):

Organization name(s)

v. Submitters

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

Name Affiliation

Chapter 1. Scope

NOTE	Insert Scope text here. Give the subject of the document and the aspects of that scope covered by the document.

Chapter 2. Conformance

This Best Practice defines XXXX.

Requirements for N target types are considered: * AAAA * BBBB

Conformance with this Best Practice shall be checked using all the relevant tests specified in Annex A (normative) of this document.

In order to conform to this OGC® Best Practice, a software implementation shall choose to implement: * Any one of the conformance levels specified in Annex A (normative). * Any one of the Distributed Computing Platform profiles specified in Annexes TBD through TBD (normative).

All requirements-classes and conformance-classes described in this document are owned by the document(s) identified.

Chapter 3. References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

NOTE

Insert References here. If there are no references, state “There are no normative references”.

References are to follow the Springer LNCS style, with the exception that optional information may be appended to references: DOIs are added after the date and web resource references may include an access date at the end of the reference in parentheses. See examples from Springer and OGC below.

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

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

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

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

Foster, I., Kesselman, C., Nick, J., Tuecke, S.: The Physiology of the Grid: an Open Grid Services Architecture for Distributed Systems Integration. Technical report, Global Grid Forum (2002)

National Center for Biotechnology Information, http://www.ncbi.nlm.nih.gov

ISO / TC 211: ISO 19115-1:2014 Geographic information — Metadata — Part 1: Fundamentals (2014)

ISO / TC 211: ISO 19157:2013 Geographic information — Data quality (2013)

ISO / TC 211: ISO 19139:2007 Geographic information — Metadata — XML schema implementation (2007)

ISO / TC 211: ISO 19115-3: Geographic information — Metadata — Part 3: XML schemas (2016)

OGC: OGC 15-097 OGC Geospatial User Feedback Standard. Conceptual Model (2016)

OGC: OGC 12-019, OGC City Geography Markup Language (CityGML) Encoding Standard (2012)

OGC: OGC 14-005r3, OGC IndoorGML (2014)

Chapter 4. Terms and Definitions

This document uses the terms defined in Sub-clause 5.3 of [OGC 06-121r8], 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 Best Practice.

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

4.1. term name

text of the definition

Chapter 5. Conventions

This sections 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 document 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.

Chapter 6. SDW Use Cases

Use cases that describe current problems or future opportunities for spatial data on the Web have been gathered as a first activity of the Working Group. They were mainly contributed by members of Working Group, but there were also contributions from other interested parties. In this chapter these use cases are listed and identified. Each use case is related to one or more Working Group deliverables and to one or more requirements for future deliverables.

6.1. 4.1 Meteorological data rescue

Contributed By: Chris Little, based on scenarios used for the WMO infrastructure requirements.

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.42 Spatial metadata, 5.7 Coverage temporal extent, 5.9 CRS definition, 5.10 Date, time and duration, 5.12 Different time models, 5.13 Discoverability, 5.18 Georeferenced spatial data, 5.23 Linkability, 5.29 Multilingual support, 5.32 Nominal temporal references, 5.34 Observed property in coverage, 5.35 Provenance, 5.36 Quality per sample, 5.37 Reference data chunks, 5.40 Sensing procedure, 5.39 Sensor metadata, 5.41 Space-time multi-scale, 5.45 Spatial vagueness, 5.54 Temporal reference system, 5.57 Uncertainty in observations, 5.8 Crawlability

6.2. 4.2 Habitat zone verification for designation of Marine Conservation Zones

Contributed By: Jeremy Tandy

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.18 Georeferenced spatial data, 5.20 Identify coverage type, 5.35 Provenance, 5.37 Reference data chunks, 5.39 Sensor metadata, 5.9 CRS definition, 5.26 Mobile sensors, 5.23 Linkability, 5.31 Nominal observations, 5.19 Humans as sensors, 5.51 Support for 3D, 5.16 Ex-situ sampling, 5.40 Sensing procedure, 5.43 Spatial relationships

6.3. 4.3 Real-time wildfire monitoring

Contributed By: Manolis Koubarakis

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.9 CRS definition, 5.11 Determinable CRS, 5.17 Georectification, 5.23 Linkability, 5.20 Identify coverage type, 5.35 Provenance, 5.39 Sensor metadata, 5.14 Dynamic sensor data, 5.46 SSN-like representation

6.4. 4.4 Diachronic burnt scar Mapping

Contributed By: Manolis Koubarakis

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.9 CRS definition, 5.11 Determinable CRS, 5.17 Georectification, 5.23 Linkability, 5.20 Identify coverage type, 5.35 Provenance, 5.39 Sensor metadata, 5.46 SSN-like representation

6.5. 4.5 Harvesting of Local Search Content

Contributed By: Ed Parsons

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL

Related Requirements: 5.2 Avoid coordinate transformations, 5.6 Coordinate precision, 5.8 Crawlability, 5.10 Date, time and duration, 5.11 Determinable CRS, 5.13 Discoverability, 5.24 Linking geometry to CRS

6.6. 4.6 Locating a thing

Contributed By: Ed Parsons

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.11 Determinable CRS, 5.21 Independence on reference systems, 5.24 Linking geometry to CRS, 5.53 Time dependencies in CRS definitions, 5.25 Machine to machine, 5.43 Spatial relationships

6.7. 4.7 Publishing geographical data

Contributed By: Frans Knibbe

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.51 Support for 3D, 5.3 Bounding box and centroid, 5.4 Compatibility with existing practices, 5.24 Linking geometry to CRS, 5.30 Multiple CRSs, 5.43 Spatial relationships

6.8. 4.8 Consuming geographical data in a Web application

Contributed By: Frans Knibbe

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.2 Avoid coordinate transformations, 5.3 Bounding box and centroid, 5.5 Compressibility, 5.8 Crawlability, 5.11 Determinable CRS, 5.21 Independence on reference systems, 5.24 Linking geometry to CRS, 5.52 Support for tiling

6.9. 4.9 Enabling publication, discovery and analysis of spatiotemporal data in the humanities

Contributed By: Frans Knibbe, Karl Grossner

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL

Related Requirements: 5.2 Avoid coordinate transformations, , 5.6 Coordinate precision, 5.10 Date, time and duration, 5.11 Determinable CRS, 5.24 Linking geometry to CRS, 5.30 Multiple CRSs, 5.32 Nominal temporal references, 5.41 Space-time multi-scale, 5.55 Temporal vagueness, 5.53 Time dependencies in CRS definitions, 5.21 Independence on reference systems, 5.43 Spatial relationships

6.10. 4.10 Publishing geospatial reference data

Contributed By: Clemens Portele

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.60 Validation, 5.23 Linkability, 5.44 Spatial operators, 5.18 Georeferenced spatial data

6.11. 4.11 Integration of governmental and utility data to enable smart grids

Contributed By: Frans Knibbe

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.11 Determinable CRS, 5.13 Discoverability, 5.23 Linkability, 5.39 Sensor metadata, 5.42 Spatial metadata, 5.48 SSN usage examples

6.12. 4.12 Using spatial data during emergency response operations

Contributed By: Bart van Leeuwen

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.2 Avoid coordinate transformations, 5.4 Compatibility with existing practices, 5.11 Determinable CRS, 5.13 Discoverability, 5.23 Linkability, 5.24 Linking geometry to CRS, 5.42 Spatial metadata, 5.43 Spatial relationships, 5.50 Subject equality

6.13. 4.13 Publication of air quality data aggregations

Contributed By: Alejandro Llaves, Miguel Angel García-Delgado (OEG-UPM), Rubén Notivol, Javier Celma (Ayuntamiento de Zaragoza)

Click to view full use case description

Related Deliverables: 2.4 Semantic Sensor Network Vocabulary, 2.3 Time Ontology in OWL

Related Requirements: 5.10 Date, time and duration, 5.33 Observation aggregations

6.14. 4.14 Publication of transport card validation and recharging data

Contributed By: Alejandro Llaves (OEG-UPM)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.53 Time dependencies in CRS definitions, 5.48 SSN usage examples

6.15. 4.15 Combining spatial RDF data for integrated querying in a triplestore

Contributed By: Matthew Perry (Oracle)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.2 Avoid coordinate transformations, 5.11 Determinable CRS, 5.15 Encoding for vector geometry, 5.24 Linking geometry to CRS, 5.42 Spatial metadata

6.16. 4.16 Dutch Base Registry

Contributed By: Linda van den Brink

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.2 Avoid coordinate transformations, 5.5 Compressibility, , 5.6 Coordinate precision, 5.11 Determinable CRS, 5.23 Linkability, 5.24 Linking geometry to CRS, 5.30 Multiple CRSs

6.17. 4.17 Publishing Cultural heritage data

Contributed By: Lars G. Svensson

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.5 Coverage in Linked Data

Related Requirements: 5.7 Coverage temporal extent, 5.10 Date, time and duration, 5.18 Georeferenced spatial data, 5.32 Nominal temporal references, 5.21 Independence on reference systems, 5.58 Update datatypes in OWL Time, 5.41 Space-time multi-scale, 5.55 Temporal vagueness, 5.45 Spatial vagueness, 5.60 Validation

6.18. 4.18 Dissemination of 3D geological data

Contributed By: Rachel Heaven

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.5 Coverage in Linked Data

Related Requirements: 5.13 Discoverability, 5.18 Georeferenced spatial data, 5.20 Identify coverage type, 5.24 Linking geometry to CRS, 5.34 Observed property in coverage, 5.36 Quality per sample, 5.37 Reference data chunks, 5.51 Support for 3D, 5.59 Use in computational models, 5.42 Spatial metadata, 5.52 Support for tiling, 5.5 Compressibility, 5.23 Linkability

6.19. 4.19 Publication of raw subsurface monitoring data

Contributed By: Rachel Heaven

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.19 Humans as sensors, 5.9 CRS definition, 5.14 Dynamic sensor data, 5.18 Georeferenced spatial data, 5.20 Identify coverage type, 5.23 Linkability, 5.24 Linking geometry to CRS, 5.1 4D model of space-time, 5.31 Nominal observations, 5.33 Observation aggregations, 5.38 Sampling topology, 5.40 Sensing procedure, 5.39 Sensor metadata, 5.42 Spatial metadata, 5.45 Spatial vagueness, 5.51 Support for 3D, 5.41 Space-time multi-scale, 5.48 SSN usage examples, 5.56 Time series, 5.57 Uncertainty in observations, 5.62 Virtual observations

6.20. 4.20 Use of a place name ontology for geo-parsing text and geo-enabling searches

Contributed By: Rachel Heaven

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.12 Different time models, 5.10 Date, time and duration, 5.51 Support for 3D, 5.32 Nominal temporal references, 5.54 Temporal reference system, 5.55 Temporal vagueness, 5.45 Spatial vagueness, 5.43 Spatial relationships, 5.61 Valid time, 5.42 Spatial metadata

6.21. 4.21 Driving to work in the snow

Contributed By: Cory Henson (Bosch RTC)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.19 Humans as sensors, 5.10 Date, time and duration, 5.11 Determinable CRS, 5.13 Discoverability, 5.14 Dynamic sensor data, 5.18 Georeferenced spatial data, 5.22 Lightweight API, 5.27 Model actuation, 5.28 Moving features, 5.31 Nominal observations, 5.32 Nominal temporal references, 5.39 Sensor metadata, 5.25 Machine to machine, 5.5 Compressibility

6.22. 4.22 Intelligent Transportation System

Contributed By: Antoine Zimmermann

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.10 Date, time and duration, 5.26 Mobile sensors, 5.27 Model actuation, 5.28 Moving features, 5.31 Nominal observations, 5.41 Space-time multi-scale, 5.48 SSN usage examples, 5.54 Temporal reference system

6.23. 4.23 Optimizing energy consumption, production, sales and purchases in Smart Grids

Contributed By: Antoine Zimmermann

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Related Deliverables: 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.23 Linkability, 5.27 Model actuation, <<SSNExamples,5.48 SSN usage examples]

6.24. 4.24 Linked Data for tax assessment

Contributed By: Luigi Selmi (via public-sdw-comments)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.11 Determinable CRS, 5.13 Discoverability, 5.23 Linkability, 5.24 Linking geometry to CRS

6.25. 4.25 Images, e.g. a time series of a water course

Contributed By: Kerry Taylor (on behalf of Jamie Baker, Australian Commonwealth Department of Communications)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.13 Discoverability, 5.18 Georeferenced spatial data, 5.20 Identify coverage type, 5.37 Reference data chunks, 5.41 Space-time multi-scale, 5.56 Time series, 5.51 Support for 3D, 5.39 Sensor metadata, 5.9 CRS definition, 5.23 Linkability, 5.35 Provenance, 5.38

Sampling topology, 5.10 Date, time and duration, 5.36 Quality per sample, 5.61 Valid time

6.26. 4.26 Droughts in geological complex environments where groundwater is important

Contributed By: Chris Little (on behalf of Andrew G Hughes, British Geological Survey)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.23 Linkability, 5.35 Provenance, 5.36 Quality per sample, 5.31 Nominal observations, 5.51 Support for 3D, 5.62 Virtual observations, 5.14 Dynamic sensor data, 5.59 Use in computational models, 5.56 Time series

6.27. 4.27 Soil data applications

Contributed By: Simon Cox (on behalf of Peter Wilson, Bruce Simons @ CSIRO)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.13 Discoverability, 5.20 Identify coverage type, 5.33 Observation aggregations, 5.34 Observed property in coverage, 5.36 Quality per sample, 5.41 Space-time multi-scale, 5.62 Virtual observations, 5.40 Sensing procedure, 5.19 Humans as sensors

6.28. 4.28 Bushfire response coordination centre

Contributed By: Simon Cox (on behalf of Paul Box, Simon Cox and Ryan Fraser @ CSIRO)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.2 Avoid coordinate transformations, 5.23 Linkability, 5.39 Sensor metadata, 5.45 Spatial vagueness, 5.48 SSN usage examples

6.29. 4.29 Observations on geological samples

Contributed By: Simon Cox

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Related Deliverables: 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.10 Date, time and duration, 5.12 Different time models, 5.18 Georeferenced spatial data, 5.23 Linkability, 5.35 Provenance, 5.39 Sensor metadata, 5.16 Ex-situ sampling, 5.38 Sampling topology, 5.40 Sensing procedure, 5.48 SSN usage examples, 5.19 Humans as sensors, 5.54 Temporal reference system

6.30. 4.30 Spatial sampling

Contributed By: Simon Cox

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.9 CRS definition, 5.18 Georeferenced spatial data, 5.23 Linkability, 5.26 Mobile sensors, 5.39 Sensor metadata, 5.41 Space-time multi-scale, 5.48 SSN usage examples, 5.45 Spatial vagueness, 5.38 Sampling topology, 5.57 Uncertainty in observations, 5.42 Spatial metadata

6.31. 4.31 Select hierarchical geographical regions for use in data analysis or visualisation

Contributed By: Bill Roberts (based on needs arising from Swirrl's own work)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL

Related Requirements: 5.10 Date, time and duration, 5.44 Spatial operators, 5.43 Spatial relationships, 5.61 Valid time

6.32. 4.32 Satellite data processing

Contributed By: Kerry Taylor (informed by Matt Paget and Juan Guerschman, CSIRO)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.9 CRS definition, 5.18 Georeferenced spatial data, 5.24 Linking geometry to CRS, 5.26 Mobile sensors, 5.20 Identify coverage type, 5.35 Provenance, 5.39 Sensor metadata, 5.19 Humans as sensors, 5.62 Virtual observations, 5.40 Sensing procedure, 5.21 Independence on reference systems, 5.42 Spatial metadata, 5.47 SSN profiles

6.33. 4.33 Marine observations - eMII

Contributed By: Simon Cox (on behalf of IMOS eMII)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.13 Discoverability, 5.26 Mobile sensors, 5.33 Observation aggregations, 5.34 Observed property in coverage, 5.36 Quality per sample, 5.39 Sensor metadata, 5.51 Support for 3D, 5.38 Sampling topology

6.34. 4.34 Marine observations - data providers

Contributed By: Simon Cox (on behalf of IMOS eMII)

Click to view full use case description

Related Deliverables: 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.18 Georeferenced spatial data, 5.31 Nominal observations, 5.19 Humans as sensors, 5.51 Support for 3D, 5.48 SSN usage examples, 5.57 Uncertainty in observations

6.35. 4.35 Marine observations - data consumers

Contributed By: Simon Cox (on behalf of IMOS eMII)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.2 Avoid coordinate transformations, 5.11 Determinable CRS, 5.24 Linking geometry to CRS, 5.40 Sensing procedure

6.36. 4.36 Building information management and data sharing

Contributed By: Linda van den Brink (with thanks to Henk Schaap - Gobar)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.51 Support for 3D, 5.11 Determinable CRS, 5.24 Linking geometry to CRS, 5.43 Spatial relationships, 5.42 Spatial metadata, 5.60 Validation, 5.11 Determinable CRS

6.37. 4.37 Landsat data services

Contributed By: Kerry Taylor (on behalf of Aaron Sedgmen of Geoscience Australia)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.5 Coverage in Linked Data

Related Requirements: 5.10 Date, time and duration, 5.13 Discoverability, 5.37 Reference data chunks, 5.56 Time series, 5.7 Coverage temporal extent, 5.52 Support for tiling

6.38. 4.38 Metadata and search granularity

Contributed By: Kerry Taylor (on behalf of Aaron Sedgmen of Geoscience Australia)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.11 Determinable CRS, 5.12 Different time models, 5.16 Ex-situ sampling, 5.32 Nominal temporal references, 5.45 Spatial vagueness, 5.51 Support for 3D, 5.41 Space-time multi-scale, 5.54 Temporal reference system

6.39. 4.39 Crowdsourced earthquake observation information

Contributed By: Kerry Taylor (on behalf of Aaron Sedgmen of Geoscience Australia)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.8 Crawlability, 5.13 Discoverability, 5.11 Determinable CRS, 5.15 Encoding for vector geometry, 5.24 Linking geometry to CRS, 5.31 Nominal observations, 5.29 Multilingual support, 5.19 Humans as sensors, 5.45 Spatial vagueness, 5.39 Sensor metadata, 5.18 Georeferenced spatial data, 5.33 Observation aggregations, 5.26 Mobile sensors, 5.51 Support for 3D, 5.14 Dynamic sensor data, 5.49 Streamable data, 5.42 Spatial metadata, 5.23 Linkability, 5.25 Machine to machine, 5.44 Spatial operators, 5.48 SSN usage examples

6.40. 4.40 TCGA / microscopy imaging

Contributed By: Erich Bremer

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.5 Coverage in Linked Data

Related Requirements: 5.7 Coverage temporal extent, 5.11 Determinable CRS, 5.24 Linking geometry to CRS, 5.37 Reference data chunks, 5.51 Support for 3D, 5.13 Discoverability, 5.42 Spatial metadata, 5.52 Support for tiling, 5.21 Independence on reference systems, 5.35 Provenance, 5.56 Time series, 5.44 Spatial operators

6.41. 4.41 Crop yield estimation using multiple satellites

Contributed By: Kerry Taylor with Zheng-Shu Zhou, CSIRO

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.51 Support for 3D, 5.2 Avoid coordinate transformations, 5.7 Coverage temporal extent, 5.24 Linking geometry to CRS, 5.46 SSN-like representation, 5.62 Virtual observations, 5.39 Sensor metadata, 5.18 Georeferenced spatial data, 5.23 Linkability, 5.41 Space-time multi-scale, 5.57 Uncertainty in observations, 5.36 Quality per sample, 5.34 Observed property in coverage, 5.20 Identify coverage type, 5.37 Reference data chunks, 5.59 Use in computational models, 5.35 Provenance, 5.56 Time series, 5.9 CRS definition, 5.56 Time series, 5.44 Spatial operators, 5.48 SSN usage examples

6.42. 4.42 Enabling cross-domain sharing and re-use of geospatial metadata

Contributed By: Andrea Perego, European Commission, Joint Research Centre (JRC)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.3 Bounding box and centroid, 5.8 Crawlability, 5.10 Date, time and duration, 5.12 Different time models, 5.13 Discoverability, 5.15 Encoding for vector geometry, 5.21 Independence on reference systems, 5.23 Linkability, 5.24 Linking geometry to CRS, 5.32 Nominal temporal references, 5.25 Machine to machine, 5.29 Multilingual support, 5.35 Provenance, 5.36 Quality per sample, 5.42 Spatial metadata, 5.54 Temporal reference system, 5.45 Spatial vagueness, 5.55 Temporal vagueness, 5.56 Time series, 5.61 Valid time

6.43. 4.43 Improving discovery of spatial data on the Web

Contributed By: Andrea Perego, European Commission, Joint Research Centre (JRC)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.8 Crawlability, 5.13 Discoverability, 5.11 Determinable CRS, 5.15 Encoding for vector geometry, 5.21 Independence on reference systems, 5.23 Linkability, 5.25 Machine to machine, 5.29 Multilingual support, 5.32 Nominal temporal references, 5.35 Provenance, 5.36 Quality per sample, 5.42 Spatial metadata, 5.45 Spatial vagueness, 5.55 Temporal vagueness

6.44. 4.44 INSPIRE compliance using Web standards

Contributed By: Erwin Folmer, Dutch Cadastre (via public-sdw-comments@w3.org)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.4 Compatibility with existing practices

6.45. 4.45 Event-like geographic features

Contributed By: Karl Grossner, Stanford Libraries

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL

Related Requirements: 5.10 Date, time and duration, 5.1 4D model of space-time, 5.41 Space-time multi-scale, 5.54 Temporal reference system, 5.55 Temporal vagueness, 5.61 Valid time

6.46. 4.46 Creation of “virtual observations” from “analysis” phase of weather prediction model

Contributed By: Jeremy Tandy, Met Office

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.3 Time Ontology in OWL, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.35 Provenance, 5.62 Virtual observations, 5.40 Sensing procedure, 5.57 Uncertainty in observations, 5.39 Sensor metadata, 5.9 CRS definition, 5.18 Georeferenced spatial data, 5.33 Observation aggregations, 5.48 SSN usage examples, 5.56 Time series

6.47. 4.47 Incorporating geospatial data (e.g. geo-referenced geometry) into interactive 3D graphics on the Web

Contributed By: Stefan Lemme, DFKI/Saarland University

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.23 Linkability, 5.49 Streamable data, 5.5 Compressibility, 5.51 Support for

3D, 5.52 Support for tiling

6.48. 4.48 Smart Cities

Contributed By: Payam Barnaghi (on behalf of the EU FP7 CityPulse Project)

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary

Related Requirements: 5.23 Linkability, 5.11 Determinable CRS, 5.14 Dynamic sensor data, 5.19 Humans as sensors, 5.26 Mobile sensors, 5.27 Model actuation, 5.31 Nominal observations, 5.22 Lightweight API, 5.48 SSN usage examples

6.49. 4.49 Provenance of climate data

Contributed By: Bruce Bannerman (Australian Bureau of Meteorology)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.4 Semantic Sensor Network Vocabulary, 2.5 Coverage in Linked Data

Related Requirements: 5.13 Discoverability, 5.33 Observation aggregations, 5.34 Observed property in coverage, 5.35 Provenance, 5.36 Quality per sample, 5.39 Sensor metadata, 5.40 Sensing procedure, 5.42 Spatial metadata, 5.48 SSN usage examples, 5.51 Support for 3D, 5.56 Time series, 5.62 Virtual observations

6.50. 4.50 Representing geospatial data in RDF

Contributed By: Phil Archer on behalf of the SmartOpendata project

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Related Deliverables: 2.2 Spatial Data on the Web Best Practices, 2.5 Coverage in Linked Data

Related Requirements: 5.4 Compatibility with existing practices, 5.23 Linkability, 5.29 Multilingual support

6.51. 4.51 Modelling in the construction sector

Contributed By: Sander Stolk (Semmtech)

Click to view full use case description

Related Deliverables: 2.2 Spatial Data on the Web Best Practices

Related Requirements: 5.50 Subject equality

Chapter 7. SDW Use Case Details

7.1. Use Case 1

This is really one of several future, but realistic, meteorological scenarios to aim at.

National Hydro-Meteorological Services around the world are coordinated via the WMO (World Meteorological Organization), part of the United Nations system. WMO has the same status as ISO, and its standards and regulatory materials applies to all its 193 national meteorological services and are available in the six working languages (□□□□ | □□ | Fr | Ru | Es | En). WMO has embarked on a long-term (think a decade or so) program to update the global meteorological operational infrastructure. This is known as the WIS (WMO Information System). The global infrastructure also has aviation, oceanographic, seismic and other users. The WIS includes a global, federated, synchronized, geospatial catalog, envisaged to encompass all hydro-meteorological data and services. Currently several nodes are operational, cataloging mainly routinely exchanged observations and forecasts.

Envisage an environmental scientist in Cambodia, researching the impact of deforestation in Vietnam as part of investigating the regional impacts of climate change. She submits her search keywords, in Cambodian, and receives responses indicating there is some data from the 1950s, printed in a 1960 pamphlet, in the Bibliothèque Nationale, a library in Paris, France, in French. She receives an abstract of some form that enables her to decide that the data are worth accessing, and initiates a request for a digital copy to be sent.

She receives the pamphlet as a scanned image of each page, and she decides that the quantitative information in the paper is useful, so she arranges transcription of the tabular numerical data and their summary values into a digital form and publishes the dataset, with a persistent identifier, and links it to a detailed coverage extent, the original paper source, the scanned pages and her paper when it is published. She also incorporates scanned charts and graphs from the original pamphlet into her paper. Her organization creates a catalog record for her research paper dataset and publishes it in the WIS global catalog, which makes it also visible to the GEO System of Systems broker portal.

7.2. Use Case 2

The Marine and Coastal Access Act 2009 allows for the creation of a type of Marine Protected Area (MPA), called a Marine Conservation Zone (MCZ). MCZs protect a range of nationally important marine wildlife, habitats, geology and geomorphology and can be designated anywhere in English and Welsh inshore and UK offshore waters.

The designation of a MCZ is dependent on a detailed analysis of the marine environment which results in the definition of geometric areas where a given habitat type is deemed to occur and is published as a habitat map.

Being a policy statement, it is important to be able to express the provenance of information that was used to compile the habitat map. Moreover, because the marine environment is always changing, it is important to express the time at which this information was collected.

The information includes:

- acoustic survey
- video (from a video camera towed behind a survey boat)
- biota observations (based on what is observed in the video and from physical collection)
- particle size (sand/mud)
- water column data
- seabed character map: discrete seabed features and backscatter information (from sonar) to determine bottom type

These information types are varied in type and size. In particular, the acoustic survey (e.g. side-scan sonar) is difficult to manage as these survey results can be many gigabytes in size and cover large areas. A way is needed to refer to just a small part of these coverage data sets that are relevant to a particular habitat zone analysis.

7.3. Use Case 3

This use case is about the wildfire monitoring service of the National Observatory of Athens (NOA) as studied in the TELEIOS project. The wildfire monitoring service is based on the use of satellite images originating from the SEVIRI (Spinning Enhanced Visible and Infrared Imager) sensor on top of the Meteosat Second Generation satellites MSG-1 and MSG-2. Since 2007, NOA operates an MSG/SEVIRI acquisition station, and has been systematically archiving raw satellite images on a 5 and 15 minutes basis, the respective temporal resolutions of MSG-1 and MSG-2.

The service active in NOA before TELEIOS can be summarized as follows:

1. The ground-based receiving antenna collects all spectral bands from MSG-1 and MSG-2 every 5 and 15 minutes respectively.
2. The raw datasets are decoded and temporarily stored in the METEOSAT Ground Station as wavelet compressed images.
3. A Python program manages the data stream in real-time by offering the following functionality:
    a. Extract and store the raw file metadata in an SQLite database. This metadata describes the type of sensor, the acquisition time, the spectral bands captured, and other related parameters. Such a step is required as one image comprises multiple raw files, which might arrive out-of-order.
    b. Filter the raw data files, disregarding non-applicable data for the fire monitoring scenario, and dispatch them to a dedicated disk array for permanent storage.
    c. Trigger the processing chain by transferring the appropriate spectral bands via FTP to a dedicated machine and initiating the following steps: (i) cropping the image to keep only the area of interest, (ii) georeferencing to the geodetic reference system used in Greece (HGRS 87), (iii) classifying the image pixels as "fire" or "non-fire" using appropriate algorithms, and finally (iv) exporting the final product to raster and vector formats (ESRI shapefiles).
    d. Dispatch the derived products to the disk array and additionally store them in a PostGIS database system.

It would be interesting for NOA to see how to use the standards developed by this Working Group to achieve the following:

- Improve the thematic accuracy of generated products.
- Generate thematic maps by combining the generated products with other kinds of data such as: Corine Land Cover, the Administrative Geography of Greece, OpenStreetMap data and Geonames.

This use case is further discussed in Real-Time Wildfire Monitoring Using Scientific Database and Linked Data Technologies. Some of the data used in the operational service is available separately.

7.4. Use Case 4

This use case was studied by the National Observatory of Athens (NOA) in the TELEIOS project. The burnt scar mapping service is dedicated to the accurate mapping of burnt areas in Greece after the end of the summer fire season, using Landsat 5 TM satellite images. The processing chain of this service is divided into three stages, each one containing a series of modules.

The pre-processing stage is dedicated to (i) identification of appropriate data, downloading and archiving, (ii) georeferencing of the received satellite images, and (iii) cloud masking process to exclude pixels “contaminated” by clouds from the subsequent processing steps.

The core processing stage comprises (i) a classification algorithm which identifies burnt and non-burnt sets of pixels, (ii) a noise removal process that is necessary to eliminate isolated pixels that have been classified wrongfully as burnt, and (ii) converting the raster intermediate product to vector format.

Finally, the post-processing stage consists of (i) a visual refinement step to ensure product thematic accuracy and consistency, (ii) attribute enrichment of the product by overlaying the polygons with geoinformation layers and finally (iii) generation of thematic maps. It would be interesting for NOA to see where the standards to be developed in this Working Group could be used.

7.5. Use Case 5

This is a rather generic and broad use case, relevant to Google but clearly also relevant to anyone interested in machine processing of HTML referring to about locations and activities that take place at those locations. Local search providers spend much time and effort creating databases of local facilities, businesses and events.

Much of this information comes from Web pages published on the public Web, but in an unstructured form. Previous attempts at harvesting this information automatically have met with only limited success. Current alternative approaches involve business owners manually adding structured data to dedicated portals. This approach, although clearly an improvement, does not really scale and there are clearly issues in terms of data sharing and freshness.

The information of interest includes:

- the facility’s address;

- the type of business/activity;
- opening hours;
- date, time and duration of events;
- telephone, e-mail and Web site details.

Complexities to this include multiple address standards, the differences between qualitative representations of place, and precise spatial co-ordinates, definitions of activities etc.

Ultimately these Web pages should become the canonical source of local data used by all Web users and services.

7.6. Use Case 6

With the increasing availability of small, mobile location aware devices the requirement to identify a location human terms is becoming more important. While the determination of sensor in space to a high level of precision is a largely solved problem we are less able to express the location in terms meaningful to humans. The fact that the Bluetooth-LE tracker attached to my bag is at 51.4256853,-0.3317991,4.234500 is much less useful than the description, "Under your bed at home". At others times the location descriptions "24 Bridgeman Road, Teddington, TW11 8AH, UK" might be equally valid, as might "Teddington", "South West London", "England", "UK", "Inside", "Where you left it Yesterday", "Upstairs", "45 minutes from here" or "150 meters from the Post Office".

A better understanding of how we describe places in human terms, the hierarchical nature of places and the fuzzy nature of many geographical entities will be needed to make the "Internet of Things" manageable. A new scale of geospatial analysis may be required using a reference frame based on the locations of individuals rather than a global spherical co-ordinate, allowing a location of your keys and their attached bluetooth tag to be described as "in the kitchen".

7.7. Use Case 7

This use case is for representing the perspective of a party that is interested in publishing data on the Web and wants to do it right with respect to the geographical component of the data. The point of this use case is that it would be good to remove barriers that stand in the way of more spatial data becoming available on the Web.

A data publisher could have the following questions:

1. How should I publish vector data? What is the best encoding to use?
2. How should I publish raster data?
3. How do I make the CRS(s) known?
4. How do I make the spatial resolution/level of detail/accuracy known?
5. Which data publishing software has good support of geographical data types and geographical functions?
6. Which data publishing software has good performance when it comes to spatial operations on data?

From the last two questions it follows that the WG could also be involved in enabling conformance testing and stimulating development of benchmarks for software.

7.8. Use Case 8

This use case is somewhat complementary to use case Publishing GeographicalD ata. It takes the consumer perspective, specifically that of a developer of a Web application that should visualize data and allow some kind of user interaction. The hypothetical Web application has little or no prior knowledge about the data it will encounter on the Web, but should be able to do something meaningful with any spatial data that are encountered, like drawing data on a map or rendering the data in a 3D cityscape.

The point of this use case is that in order for spatial data on the Web to be successful, supply and demand must be balanced to create a positive feedback loop. High quality data must be available in high quantities but those data must also be highly usable for experts as well as non-experts.

A Web application developer could have the following questions:

1. How do I find geographical data on the Web?
2. How can I tell what kind of spatial data I will get? Raster or vector? 2D or 3D?
3. Which encoding of vector data can I expect?
4. Which encoding of raster data can I expect?
5. Can I get the data with coordinates that match the coordinate system of my map?
6. What is the spatial extent of this dataset/collection of resources/resource?
7. How can I filter data to get the most appropriate spatial representation of a resource/collection of resources?
8. How can I use spatial data on the Web without having to take a four year academic course first?
9. Which spatial operations does this SPARQL endpoint support?
10. Can I use spatial operations in federated queries?
11. How can I ensure responsiveness of my application (low wait times when accessing data)?

7.9. Use Case 9

Note this use case shares characteristics with Publishing Cultural Heritage Data.

A research endeavor that has just started tries to stimulate researchers in various fields of the humanities to make research data available in such a way that the data are and remain usable by other researchers, and that the data may be used for purposes other than those envisaged by the original researcher. The emphasis lies on spatiotemporal data because they are nice to visualize (a map with a time slider) and because it is thought that it would be interesting to try to discover patterns in time and/or space in interlinked distributed data sets.

This project has the following aspects that seem relevant to this Working Group:

1. Technologies must be easy to implement for people that generally do not have a high affinity

with IT. This goes for data publishing as well as data consumption.

2. References to time and space are often inexact or have shifting frames of reference, so simple encodings like basic geo or ISO 8601 do not suffice.
3. References to time and space do need to be as exact as possible, to enable automatic discovery of spatiotemporal patterns.
4. Datasets do not just need to be published, they need to be easily discovered too, using spatial and/or temporal filters.

Adding examples below relevant to items 2 and 3 above, from one existing scholarly Web application case, which may contribute to a more general (i.e. not necessarily historical) requirement for representing several types of uncertainty: imprecision, probability, confidence. Standards for gazetteers -particularly historical (temporal) ones- are non-existent, although several projects with potentially global reach are underway. It will be helpful to have this Working Group in dialog with developers for such projects as Pelagios, Library of Congress, Pleiades, and Past Place (cf. Humphrey Southall).

Spatial

- A set of life path data were developed for a kinship network of 30,000 individual Britons linked by birth and marriage. Spatial data for the locations of life events has several levels of granularity, from street address (10 Downing Street) to country (China). How can spatial containment relationships for places be expressed so that spatial-temporal contemporaneity be calculated?
- References to places in historical works are often limited to toponyms (i.e. absent geometry or precise spatial relations), and qualified by such terms as "near," and "north of." How can these be indexed spatially so as to be discoverable?

Temporal

- As with spatial data, historical sources contain temporal references at varying granularity. A single data set may contain expressions for exact dates, months, or years — or ranges containing a mix of any of those.
- Temporal references are frequently inexact, or relational with variable precision. The above referenced data set has a mix, including "around March 1832," "before 1750," "after WW II."

7.10. Use Case 10

This use is based on the European Location Framework (ELF).

Mapping and cadastral authorities maintain datasets that provide geospatial reference data. Reference data is data that a user/developer uses to provide location for her own data (by linking to it), by providing context information about a location (overlaying his data over a background map), etc.

A key part of this is persistent identifiers for the published data to allow linking to the reference data. Let’s assume that http URIs following the Cool URI note are used as identifiers.

In ELF — and INSPIRE — reference data is typically published using a Web service by the national authority. In ELF this is an OGC Web Feature Service. To provide access to the different datasets via a single entry point, all the national services are made available via a proxy Web service that also handles authentication etc. In addition, it is foreseen to publish the reference data in other commonly used Web-based platforms for geospatial data to simplify the use of the data - developers and users can use the tools and APIs they are familiar with.

As a result, the same administrative unit (to pick an example) is basically available via multiple (document) URIs: via the national Web service, the ELF proxy Web service and Web services of the other platforms. Different services will support different representations (GML, JSON, etc.). The Web services may not be accessible by everyone and different users will have access to different document URIs.

Which real-world object and document URIs for the administrative unit should be maintained and what does a GET return in order:

- to support linking other data to the administrative unit;
- to deliver the document and representation that the user expects when dereferencing the link?

A related challenge is that today such links are often implicit. For example, a post code or a statistical unit code is a property in the other data, but the link is not explicit like an HTTP URI. What is a good practice to make use of such implicit links? Should they be converted to HTTP URIs to be explicit or are there better ways (e.g. additional context that provide information about the semantics and a pattern how to construct dereferenceable URIs)?

7.11. Use Case 11

The research project CERISE-SG aims to integrate data from different domains: government, energy utilities and geography, in order to enable establishment of smart energy grids.

The project has recognized Linked Data as an appropriate concept for integration of data from separate semantic domains. One approach of achieving cross-domain interoperability is to switch from domain-specific semantics to common semantics. For example, the concept of an address has its own definitions in governmental standards and utility standards. Using a common definition improves interoperability.

An example of a domain model that is an international standard in electric utilities is the Common Information Model (CIM). Its data model provides definitions for an important entity: the electricity meter. These meters provide useful data on consumption and production of energy. If it is possible to view these devices as sensors, it could be possible to move from domain specific semantics (CIM) to common semantics (SSN), and to have ready linkage to geographical semantics (location and network topology). What is required in this case is a low-threshold way of using sensor semantics, because people involved in integration of data from multiple domains should not be burdened with having to grasp the full complexity of each domain.

7.12. Use Case 12

Emergency response services in the Netherlands use Spatial Data Infrastructures (SDI) to help manage large scale incidents. Predefined geographical data from their GIS warehouses can be used, but incidents and accidents are by nature unpredictable so it is impossible to determine beforehand which data are needed. In-house data need to be supplemented with data from other sources based on ad-hoc requirements. Typically, supplemental data are available through WxS services. This poses several problems:

1. Third party data lack semantics in the sense of the Web of data. Under the umbrella of various projects a first attempt has been made to at least share definitions of the terminology used by various emergency response services, both national and cross border. This resulted in the start of a project called the Firebrary. Now the terminology and definitions are available on the Web as linked data as SKOS. Still linking from the spatial data to these definitions and vice versa is not standardized. Publication of Web semantics with spatial data would improve discoverability of applicable data and facilitate linking data from separate sources.
2. It is not possible to predefine relationships between Web data and data exposed through WxS services (rdfs:seeAlso is considered by many to be too limited).
3. It is not easy to share all data related to an incident as Web data.

Being able to plot and exchange data about active incidents through the Web and visualize them in GIS tools with open standards would be a huge leap forward for emergency response services.

7.13. Use Case 13

What: The local authorities of Zaragoza (Spain) want to publish the air quality data of the city. Each observation station has a spatial location described with an address. The dataset contains hourly observations and daily aggregations of different gases, e.g. SO2, NO2, O3, CO, etc.

How: We use the Location Core vocabulary to model the address, e.g. :station locn:address "C/ Gran Vía (Paraninfo)"^^xsd:string. We use xsd:dateTime to represent hourly observations, e.g. :obs ssn:observationResultTime "2003-03-08T11:00:00Z"^^xsd:dateTime.

Open challenges: The combination of hourly observations and daily aggregations in the same dataset may cause confusion because the granularity of the observation is not explicit. For daily aggregations, we suggest using time:Interval from the Time Ontology. To make the temporal modeling more homogeneous, time:Instant could be used for the hourly observations.

A description of the data set, including its SPARQL endpoint, can be found at https://www.zaragoza.es/ciudad/risp/detalle_Risp?id=131.

7.14. Use Case 14

What: The Regional Transport Consortium of Madrid (CRTM) wants to make available data about transport card validations and transport card recharging. In the case of transport card validations, the NFC sensors are located on buses, and at the entrance and (some) exit points of metro stations. The observation value of a validation includes data related to the transport card, such as the card identifier and the user profile. The sensors for transport card recharging are ATMs and ticket selling points distributed around Madrid. The observation value of a recharging includes the card identifier and the type of recharging.

How: To model transport card validations, we consider two observed properties: user entry (EntradaUsuario) and user exit (SalidaUsuario). Validation sensors at metro stations have a fixed location and a unique identifier, e.g. 02_L12_P2. A bus validation sensor is moving continuously, so for the sake of pragmatism, there is a unique sensor identifier for each bus stop in every line, e.g. 03_L20_P837. Those identifiers point to an address and geographic coordinates. The observed property when a user adds money to her transport card is the act of recharging (CargaTTP). In both cases, validation and recharging observations, the feature of interest is the transport card.

7.15. Use Case 99

Place holder for use cases which are under construction.

Annex A: Conformance Class Abstract Test Suite (Normative)

NOTE	Ensure that there is a conformance class for each requirements class and a test for each requirement (identified by requirement name and number)

A.1. Conformance Class A

A.1.1. Requirement 1

Test id:	/conf/conf-class-a/req-name-1
Requirement:	/req/req-class-a/req-name-1
Test purpose:	Verify that…
Test method:	Inspect…

A.1.2. Requirement 2

Annex B: Title ({Normative/Informative})

NOTE Place other Annex material in sequential annexes beginning with "B" and leave final two annexes for the Revision History and Bibliography

Annex C: Revision History

Date	Release	Editor	Primary clauses modified	Description
2016-04-28	0.1	G. Editor	all	initial version

Annex D: Bibliography

NOTE

Example Bibliography (Delete this 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)

[n] Web: Author Surname, A.: Title, http://Website-Url

[1] OGC: OGC Testbed 12 Annex B: Architecture. (2015).