INSPIRE

Infrastructure for Spatial Information in Europe

News from Standardisation Bodies

Type	Document for information and discussion
Creator	EC and EEA INSPIRE Team
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Identifier	**MIG/11/2020/DOC9**
Description	This documents summarises new developments and activities relevant to INSPIRE maintenance and implementation from the following standardisation bodies: • ISO TC/211 Geographic Information/Geomatics • Open Geospatial Consortium (OGC) • World Wide Web Consortium (W3C)
Actions:	MIG to: • Take note of the document • Discuss possible coordinated actions related to the presented standardisation activities

1. ISO/TC 211 Geographic Information/ Geomatics

1.1. General progress of work in ISO/TC 211

The number of standards developed by ISO/TC 211 is growing, at the Systematic reviews of the existing standards requires substantial engagement. The technology develops rapidly, and it is essential to revise the standards. In addition, the digital transformation of Governments and the increased user requirements within the geospatial domain requires that standards are revised accordingly.

ISO/TC 211 continues the cooperation with other SDOs, particularly OGC and IHO, and a liaison arrangement is now made between W3C and ISO/TC 211 WG4.

The long-term financing and maintenance of the authoritative ISO Geodetic registry is of strategic importance. The register is of crucial value for the Global Geodetic Reference Frame (GGRF), as part of the UN-GGIM and International Association of Geodesy (IAG) work, thus needing a sustainable solution. All GIS-users around the globe will benefit from this register. Initiatives will be taken this year to reach out to geodetic agencies and mapping agencies for discussions on solutions.

For a deeper insight of the environment and progress of ISO/TC 211, it is recommended to take part of the yearly report prepared jointly by ISO/TC 211, OGC and IHO for the United Nations Committee of Experts on Global Geospatial Information Management, UN-GGIM, at the 9th session in August 2019. http://ggim.un.org/meetings/GGIM-committee/9th-Session/documents/E-C.20-2020-16-Add_1_Implementation_and_Adoption_of_Standards.pdf

The new version of the ISO/TC 211 Strategic Business Plan was published in December 2019. ISO/TC 211 Strategic Business Plan

As part of the increased focus on outreach activities, the ongoing initiative to collect user stories is a part of celebrating this year's 50th plenary anniversary. Please take part and share with your colleagues. The ISO/TC 211 50th plenary anniversary User Story Challenge

More information about the committee and the program of work is available at the web site https://committee.iso.org/home/tc211

1.2. Status of standardization activities

New initiatives

Ontology is increasingly getting a wider focus, and a new standardization work is initiated on TC 211 ontologies and the application to these in different communities/domains. The initiatives on Land Administration and on Land Cover/Land Use are both in preparatory stages, however very well developed already.

Published standards

Below is a list of publications since Q3 2019.

Table. List of recent published standards.

Reference	**Document title**
ISO 19150-4:2019	Geographic information — Ontology — Part 4: Service ontology
ISO 19162:2019	Geographic information — Well-known text representation of coordinate reference systems
ISO 19116:2019	Geographic information — Positioning services
ISO 19107:2019	Geographic information — Spatial schema
ISO/TR 19167:2019	Application of ubiquitous public access to-geographic information to an air quality information service
ISO 19136-1:2020	Geographic information — Geography Markup Language (GML) — Part 1: Fundamentals
ISO 19161-1:2020	Geographic information — Geodetic references — Part 1: International terrestrial reference system (ITRS)
ISO 19160-3:2020	Addressing — Part 3: Address data quality

Other publications are well on their way. The revised version of ISO 19131 Data product specification is now on FDIS (Final Draft International Standard), and it will soon be finalized as an International Standard.

1.3. ISO standards applied in INSPIRE

Regarding ISO standards applied in INSPIRE, an updated list of ISO standards (some of theme also OGC standards due to joint work) is provided below. Several of the ISO/TC 211 standards are now revised and available as the second generation of standards. A list of the revision history of these standards can be provided upon request.

Table. The table shows ISO/TC 211 standards referenced in the INSPIRE implementing rules (Ref https://inspire.ec.europa.eu/inspire-legislation/26 . Where standards are dated, the date is added to the text. There are both dated and undated references.

	19101	**19103 (2005)**	**19106**	**19107 (2005)**	**19108 (2005)/**	**19109 (2006)**	**19111**	**19111-2 (2012)**	**19118**	**19115 (2005)/AC2008**	**19119 (2005)/**	**19123 (2007)**	**19125-1**	**19127**	**19128 (2008)**	**19135 (2007)**	**19136 (2009)**	**19139 (2009)**	**19144-2 (2012)**	**19156 (2011)**
Metadata	x									x	x									
Data specification		x		x	x		x		x	x		x	x	x	x	x	x	x	x	x

Network services															x				
Data & Service Sharing																			

Points of contact

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Contribution: Morten Borrebæk, Norway

2. Open Geospatial Consortium (OGC)

OGC's member-driven consensus process creates royalty free, public available open standards. Existing at the cutting edge, OGC actively analyses and anticipates emerging tech trends, and runs an agile, collaborative Research and Development (R&D) lab - the OGC Innovation Program - that builds and tests innovative prototype solutions to members' use cases.

OGC members together form a global forum of experts and communities that use location to connect people with technology and improve decision-making at all levels. OGC is committed to creating a sustainable future for us, our children, and future generations.

2.1. Status of standardisation activities in Q3 and Q4 of 2019

- **11 Standards approved**
    - OGC 18-073r2: PipelineML
    - OGC 13-026r9: OpenSearch Extension for Earth Observation (OpenSearch-EO)
    - OGC 17-003r1: OGC EO Dataset Metadata GeoJSON(-LD) Encoding Standard
    - OGC 17-047: OGC OpenSearch-EO GeoJSON(-LD) Response Encoding Standard
    - OGC 17-069r2: OGC API – Features: Part 1 – Core
    - OGC 19-008r3: OGC GeoTIFF
    - OGC 15-045r7: OGC MetOcean Application profile for WCS2.1: Part 0 - MetOcean Metadata
    - OGC 15-108r3: OGC MetOcean Application profile for WCS2.1: Part 1 - MetOcean GetCorridor Extension
    - OGC 17-086r3 OGC MetOcean Application profile for WCS2.1: Part 2 - MetOcean GetPolygon Extension
    - OGC 19-013: OGC WaterML 2: Part 4 – GroundWaterML 2 (GWML2) v2.3
    - OGC 12-000r1: OGC SensorML: Model and XML Encoding v2.1

- **8 Engineering Reports approved**

Engineering Reports are created as deliverables in the OGC Innovation Program to describe the work and results of interoperability initiatives. OGC Engineering Reports are not standards and should not be referenced as required or mandatory technology in procurements. However, the discussions in these documents could very well lead to the definition of OGC standards.

    - OGC 19-025r1: Development of Spatial Data Infrastructures for Marine Data Management
    - OGC 19-030r1: OGC Mixed Reality to the Edge Concept Development Study
    - OGC 19-007: OGC CDB Vector Data in GeoPackage Interoperability Experiment
    - OGC 19-003: Earth System Grid Federation (ESGF) Compute Challenge

  - OGC 18-090r2: OGC Testbed-14: Federated Clouds Engineering Report
  - OGC 18-089: OGC Indoor Mapping and Navigation Pilot Engineering Report
  - OGC 19-062: OGC API Hackathon 2019 Engineering Report
  - OGC 17-090r1: Model for Underground Data Definition and Integration (MUDDI) Engineering Report

- **2 Discussion or White Papers approved**

Discussion papers are documents that present technology issues being considered in the Working Groups of the OGC Technical Committee. Their purpose is to create discussion in the geospatial information industry on a specific topic. A white paper is an OGC member approved publication released by the OGC to the Public that states a position on one or more technical considerations, often including a high-level explanation of a standards based architecture or framework of a solution. Both document types do not represent an official position of the OGC.

  - OGC 19-042r1: Discussion Paper - JSON Encodings for EO Coverages
  - OGC 19-047: Proposed OGC GeoPackage Enhancements

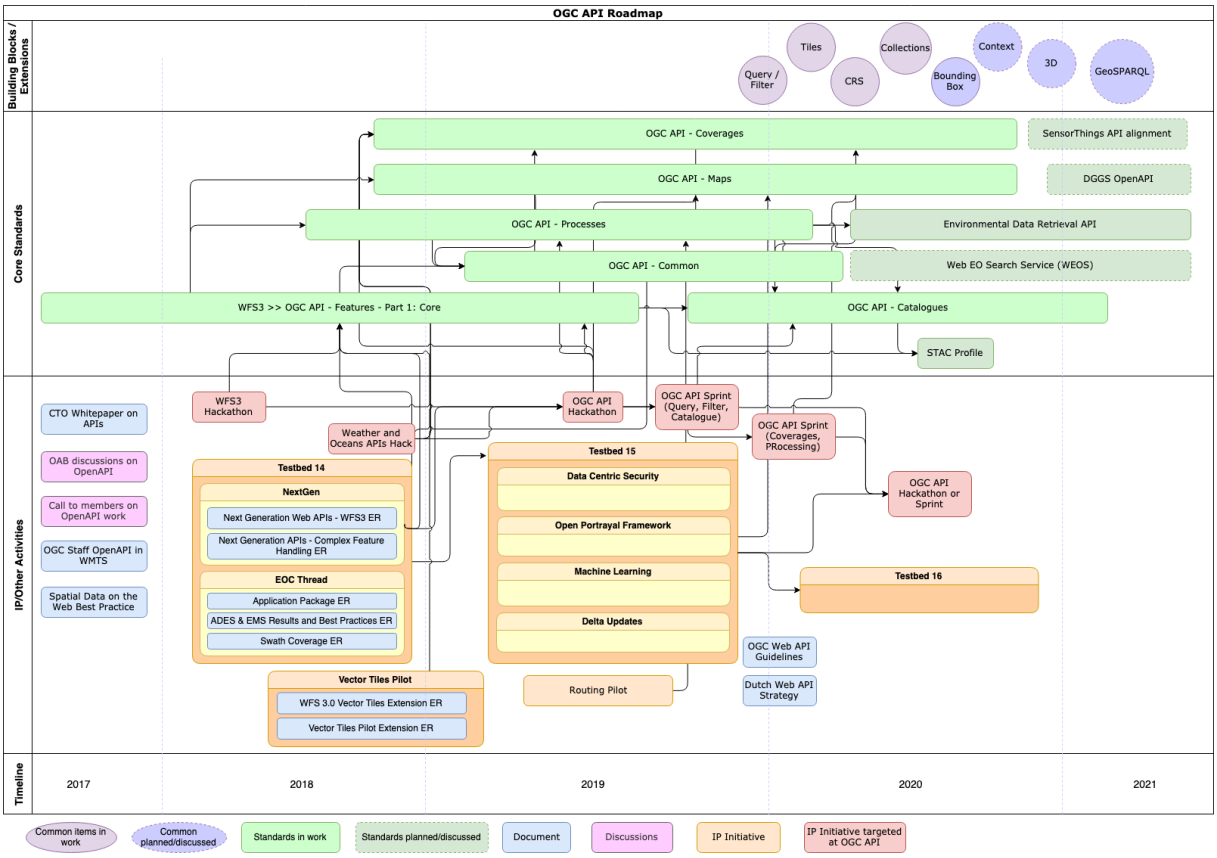
- **3 new Standards Working Groups (SWGs)**
  - Geopose SWG
  - OGC API – Records SWG
  - Environmental Data Retrieval API SWG

2.2. OGC API Roadmap

By now, many stakeholders have heard about new OGC standards in work that leverage OpenAPI and are being characterised as anything from evolutionary to revolutionary. Please find below the OGC API Roadmap - and find additional input on the OGC API approach and activities on the OGC website at the following blog posts:

- OGC APIs and the evolution of OGC standards (https://www.ogc.org/blog/2996)
- OGC API Hackathon 2019 - How it went! (https://www.ogc.org/blog/3025)

In addition, at the March 2020 OGC members meeting in Ottawa, there was a special session on the OGC API family of standards. The recording is available for members on the OGC member portal.



2.3. Technical / Planning Committee Meetings

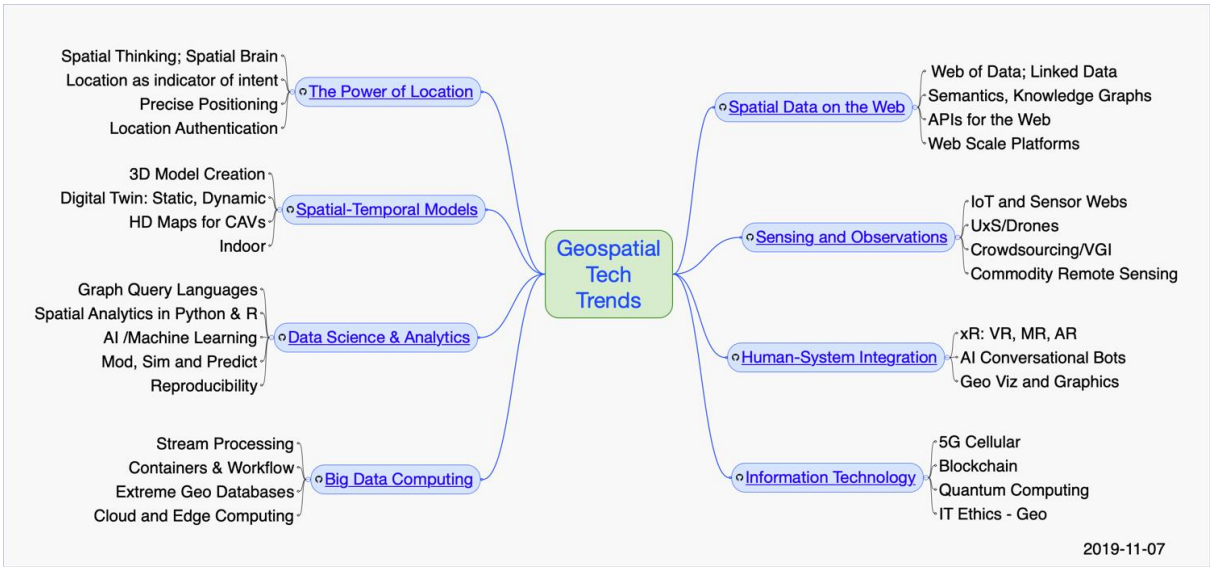
Date	Location	Host/Sponsor
2-6 March 2020	Ottawa, Canada	Natural Resources Canada and ESRI Canada
June 2020	Montreal, Canada	CAE
14-18 Sept 2020	Munich, Germany	TUM
Dec 2020	Palo Alto, CA USA or Atlanta, GA USA (TBC)	
Feb or March 2021 (or 2022)	Offer from India (TBC)	NRSC, DST, SOI
June 2021	Madrid, Spain (TBC)	
October 2021	Americas	

2.4. OGC Tech Trends (November 2019)

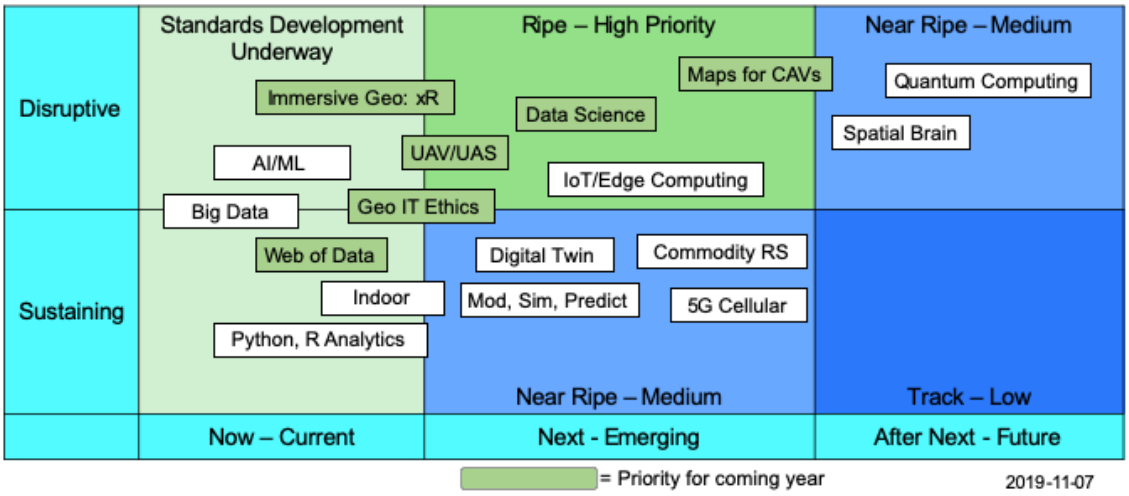
Change in the technology industry is constant. The OGC Technology Trends process (http://www.opengeospatial.org/OGCTechTrends) looks at a wide variety of sources for trends information including: industry reports, international research, OGC members, alliance partners and staff.

Why does OGC track geo technology trends?

OGC's position on Innovation (2014): "develop standards to support evolving and potentially disruptive technologies, community needs and market trends." The Technology Trends Watch is a formal technology strategy, lead by the OGC CTO, to track and promote technology evolution.



OGC Geospatial Tech Trends Priorities[1]



Points of contact

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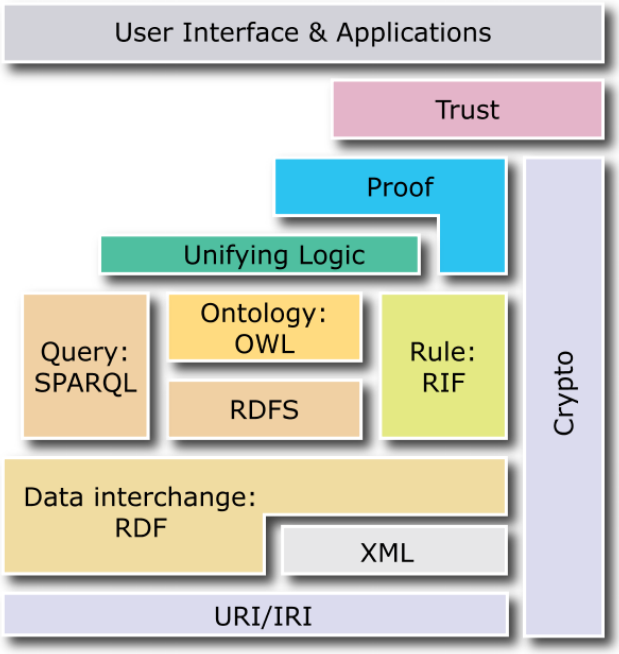
[1] Publicly Available at: https://github.com/opengeospatial/OGC-Technology-Trends

3. World Wide Web Consortium (W3C)

The World Wide Web Consortium (W3C) is an international community where Member organizations, a full-time staff, and the public work together to develop Web standards. Led by Web inventor and Director Tim Berners-Lee and CEO Jeffrey Jaffe, W3C's mission is to lead the Web to its full potential. Contact W3C for more information.

W3C has a large suite of standards (W3C Recommendations) for Web browsers (the Open Web Platform) and for the Web of Data. W3C features Working Groups that produce standards, Interest Groups, and Community Groups, which are a popular means for incubating new work prior to transfer to the standards track.

The following figure illustrates how W3C's suite of standards for data fit together, but omits more recent work, which is described in the text below.



The Resource Description Framework (RDF) supports graphs with labelled directed edges, where the vertices and the edge labels are associated with URIs as globally unique identifiers, that may be dereferenceable to obtain further information, forming a Web of data and metadata.

RDF has a variety of serialisations including RDF/XML, Turtle, and most recently JSON-LD, which as the name suggests is based upon the JavaScript Object Notation (JSON). JSON-LD 1.1 was released as a Candidate Recommendation in December 2019.

SPARQL is a query language for RDF, analogous to SQL for RDBMS. The latest specification is SPARQL 1.1, and discussions are currently underway on whether to standardise further extensions to the core query language. The Linked Data Platform (LDP) defines a set of rules for HTTP operations on web resources, some based on RDF, to provide an architecture for read-write Linked Data on the web.

Vocabularies of terms for RDF can be expressed using RDF Schema (RDFS) and OWL (the Web ontology language), which is based on description logics with some additional features for versioning and annotations. The latest version is OWL2 and includes three variants with different levels of expressiveness (Lite, DL and Full).

The RDF Shapes Constraint Language (SHACL) provides a language for validating RDF graphs against a set of conditions. SHEX is a proposed structural schema language for validation, traversal and transformation of RDF graphs, that is inspired by regular expressions for string literals.

The Rule Interchange Format (RIF) provides a means for exchanging rules between rule systems, as it was clear that a single language would not satisfy the needs of many popular paradigms for using rules in knowledge representation and business modelling. RIF distinguishes logic-based rules from action-based rules.

W3C's Spatial Data on the Web Working Group (now closed) produced two W3C Recommendations in collaboration with OGC: the Time Ontology in OWL and the Semantic Sensor Network Ontology (SSN), which can be used to describe sensors and their observations, the involved procedures, the studied features of interest, the samples used to do so, and the observed properties, as well as actuators. The Spatial Data on the Web Interest Group has continued the collaboration with the OGC, working together on extensions to SSN, including SOSA as a lightweight ontology for sensors, observations, samples and actuators, that enables better linking, and homogeneous collections of observations.

W3C's Web of Things Interest Group and Working Group have both been recently rechartered and have developed standards for digital twins that decouple client applications from the physical location, and the communications technologies for connecting to sensors and actuators. W3C Recommendations have been prepared for Thing Descriptions and Architecture. Related work has focused on security and a proposed scripting API.

On a related note, W3C is hosting work on extensions to schema.org to support IoT devices, whilst the Linked Building Data Community Group focuses on building information modelling (BIM) and Web of Data technologies to define existing and future use cases and requirements for linked data applications.

The Dataset Exchange Working Group has released a second version of the data catalogue vocabulary (DCAT2). DCAT is an RDF vocabulary designed to facilitate interoperability between data catalogues published on the Web. The Working Group is continuing related work on guidance on publishing application profiles of vocabularies, content negotiation by profile and a vocabulary for describing profiles of standards for information resources.

W3C held a workshop on graph data in Berlin in March 2019, bringing together practitioners from the communities for RDF/Semantic Web/Linked Data, SQL/RDBMS and Labelled Property Graphs, with a view to improved liaison and to inform future work on the Web of Data. The Easier RDF initiative is seeking to make semantic technologies easier for the average developer.

The emergence of the Sentient Web and the disruptive impact of Cognitive AI

From a strategic perspective, the way that information is held and processed is likely to change very considerably over the next decade as graph representations are combined with statistical information that reflect prior knowledge and past experience, inspired by advances in the cognitive sciences and hundreds of millions of years of evolution.

This is needed to support the next generation of machine learning as well as forms of reasoning that rely on statistical considerations, such as abduction which seeks explanations of observed behaviour. Traditional approaches struggle in respect to the uncertainty, incompleteness and inconsistency commonly found in real-world situations. This exacerbates the cost for preparing and cleaning data prior to analysis, a major bugbear for data science.

Relational databases are giving way to graph databases, and will in turn give way to cognitive databases that combine graph data, statistics, rules and graph algorithms. The Sentient Web is a vision for how the Web will evolve to combine sensors and actuators together with cognition, machine learning and AI as a basis for new ecosystems of smart services. See W3C's Cognitive AI Community Group for further background.

Points of contact

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