



# INSPIRE

## Infrastructure for Spatial Information in Europe

### News from Standardisation Bodies

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<b>Creator</b>	EC and EEA INSPIRE Team
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<b>Identifier</b>	<b>MIG/12/2020/DOC7</b>
<b>Description</b>	<p>This documents summarises new developments and activities relevant to INSPIRE maintenance and implementation from the following standardisation bodies:</p> <ul style="list-style-type: none"><li>• ISO/TC 211 Geographic Information/ Geomatics</li><li>• Open Geospatial Consortium (OGC)</li><li>• World Wide Web Consortium (W3C)</li></ul>
<b>actions:</b>	<p>MIG to:</p> <ul style="list-style-type: none"><li>• Take note of the document</li><li>• Discuss possible coordinated actions related to the presented standardisation activities</li></ul>

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## 1. ISO/TC 211 Geographic Information/ Geomatics

ISO/TC 211 develops open geospatial standards in close cooperation with Open Geospatial Consortium (OGC) and other liaison organizations. Members participate through their national standards bodies. Members contribute by decision making setting the scope and strategic direction, by experts developing the standard documents, and by demonstrating the adoption and implementation of standards in their organizations. ISO/TC 211 is its members and liaisons.

### 1.1. Status in adoption and implementation of standards

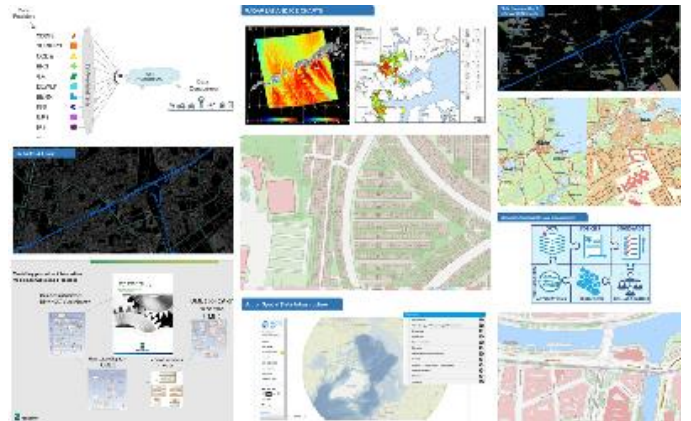
#### Sustainable development goals

ISO/TC 211, in cooperation with International Hydrographic Organization (IHO) and OGC, develops geospatial standards in direct support of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) and the UN Sustainable Development Goals (SDG). At the 10th session of UN-GGIM in August 2020, the [joint annual standard report](#) was presented.

#### The ISO/TC 211 User Story Collection

ISO/TC 211 recognizes the great need to raise awareness about geospatial standards, and the impact these have in contributing to national and international development goals. The purpose of the recently launched [User story collection](#) is to:

- raise awareness of the wide used today of geospatial standards
- raise awareness of the role of geospatial standards in framework and legislation
- raise awareness of the impact of geospatial standards
- increase the interest to participate in developing standards
- inspire organizations on how to use standards



#### ISO standards applied in INSPIRE

Some 20 ISO/TC 211 standards are referenced in the INSPIRE implementing rules. For a description of benefits, please take part of this summary [ISO/TC 211 standards in European INSPIRE Directive](#).

#### The Standards in Action seminar

The ISO/TC 211 [Standards in Action Seminar](#) in June provided many examples of the use of standards, e.g. the ISO 19160-1 standard on addresses, widely used in monitoring and blocking the contagion chain of the COVID-disease. Keep a lookout for the next seminar during the 51st plenary week at the end of November.

### 1.2. Status of standardisation activities

#### New initiatives

Ad hoc groups (AHG) or preliminary work items (PWI) initiated last six months:

- AHG on digital transformation of public administration (e-Government);
- AHG to study non-relational database technologies;
- AHG on automated documentation, to study machine-readable normative statements and model-driven documentation of standards;
- PWI for maintaining addresses assigned to objects in the physical world;
- PWI on definition of a revised structure and content for the Geographic Data Files (GDF) jointly with ISO/TC 204 Intelligent transport systems.

In line with the committee openness for solutions facilitating for developers and users, ISO/TC 211 has been approved by ISO for participating in the pilot project on ISO Standards Machine Applicable, Readable and Transferable (SMART) Standards.

### New standard projects

In September these new projects were approved by the committee members:

- ISO 19152-1 Geographic information — Land Administration Domain Model (LADM) — Part 1: Fundamentals;
- ISO 19144-2 Geographic information — Classification systems — Part 2: Land Cover Meta Language (LCML);
- ISO 19144-3 Geographic information — Classification systems — Part 3: Land Use Meta Language (LUML).

For all these projects, there is a great interest in participation from many member bodies (national standards bodies) and liaison organizations. The project proposals were prepared by United Nations Food and Agriculture Organization (FAO), and the member bodies of Australia and United Kingdom.

### Recently published standards

Below is a list of publications during 2020:

- 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;
- ISO/TS 19163-2:2020 Geographic information — Content components and encoding rules for imagery and gridded data — Part 2: Implementation schema;
- ISO 19165-2:2020 Geographic information — Preservation of digital data and metadata — Part 2: Content specifications for Earth observation data and derived digital products;
- ISO 19168-1:2020 Geographic information — Geospatial API for features — Part 1: Core.

### Committee website

<https://committee.iso.org/home/tc211>, please find useful information, such as:

- Strategic business plan, Program of work, Ongoing projects, List of all published standards
- Freely available resources: UML, xml, terms, ontologies, ISO Geodetic register
- UN-GGIM Standards Guide

## Points of contact

### **Points of contact:**

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## 2. Open Geospatial Consortium (OGC)

The OGC represents over 500 businesses, government agencies, research organizations, and universities united with a desire to make location information FAIR – Findable, Accessible, Interoperable and Reusable. Through the organization’s member-driven consensus process OGC Members create royalty free, publicly 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 test innovative prototype solutions solving real-world geospatial challenges and building on experiences by our members.

OGC members together form a global network of experts and communities. Using location, the OGC connects people, communities, technology and decision making for the good of society.

### 2.1 2020 First Half - overview

- 5 Standards approved
- 1 Best Practice approved
- 24 Engineering Reports approved
- 5 Discussion or White Papers approved
- 1 new Standards Working Group (SWG)

### 2.2 Status of standardisation activities in Q1 and Q2 of 2020

- 5 Standards approved
  - OGC 04-084r4: OGC Abstract Specification Topic 0 – Overview
  - OGC 17-014r7: Indexed 3D Scene Layer (I3S) v.1.1 Community standard
  - OGC 19-045r3: OGC Moving Features Encoding Extension – JSON
  - OGC 19-065: OpenFlight Community standard
  - OGC 19-011r3: OGC IndoorGML 1.1
- 1 Best Practice
  - OGC 17-084: EO Collection Metadata GeoJSON (-LD) Encoding
- 24 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 19-018 Testbed-15 Open Portrayal Framework
- OGC 19-019 Testbed-15 Portrayal Summary
- OGC 19-023r1 OGC Testbed 15 Style Encoding and Metadata Conceptual Model
- OGC 19-010r2 OGC Testbed-15: Styles API
- OGC 19-012 OGC Testbed-15: Delta Updates
- OGC 19-069 Testbed-15 Maps and Tiles API Draft Specification
- OGC 19-024r1 OGC Testbed-15: Federated Clouds Security
- OGC 19-016r1 Testbed-15 – Data Centric Security
- OGC 19-041r3 Open Routing Pilot
- OGC 19-040 WPS Routing API
- OGC 19-020r1 OGC Testbed-15 Catalogue and Discovery
- OGC 19-021 OGC Testbed-15: Semantic Web Link Builder and Triple Generator
- OGC 19-075r1 Borehole Interoperability Experiment
- OGC 19-027r2 Testbed-15 Machine Learning
- OGC 19-022 OGC Testbed-15 Scaling Units of work (EOC, SCALE, SEED)

- OGC 19-026 OGC Testbed-15 Federated Clouds Analytics
- OGC 19-070 Testbed-15 Images and ChangeSet API Draft Specification
- OGC 19-032 CityGML Public Safety Application Domain Extension (ADE)
- OGC 19-046 Testbed-15 Quebec Model MapML
- OGC 19-083 Citizen Science IE
- OGC 19-015r1 OGC Testbed-15 Federated Cloud Provenance
- OGC 18-009 OGC Indian Plugfest
- OGC 20-011 OGC SCIRA Pilot
- OGC 17-061 OGC FGDC API CDS
- 5 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 19-076 Health SDI: Application Areas, Recommendations, and Architecture White Paper
- OGC 19-091r1 Built environment data standards and their integration: an assessment of IFC, CityGML and LandInfra Discussion Paper
- OGC 19-090 An Experiment to Link Geo-referenced Multimedia with CityGML Objects Discussion Paper
- OGC 20-000r1 CityGML Urban Planning ADE for i-Urban Revitalization Discussion Paper
- OGC 19-077 OGC Body of Knowledge – Version 0.1 - Discussion Paper
- 1 new Standards Working Group (SWG) approved
  - Styles API SWG

### 2.3 OGC APIs and OGC API Roadmap

By now many stakeholders have heard about OGC API standards in work that leverage OpenAPI and are being characterised as anything from evolutionary to revolutionary.

The OGC API family of standards are being developed to make it easy for anyone to provide geospatial data to the web. These standards build upon the legacy of the OGC Web Service standards (WMS, WFS, WCS, WPS, etc.), but define resource-centric APIs that take advantage of modern web development practices.

The standards are being constructed as „building blocks“ that can be used to assemble novel APIs for web access to geospatial content. The building blocks are defined not only by the requirements of the specific standards, but also through interoperability prototyping and testing in the OGC’S Innovation Program. Meanwhile the INSPIRE Community has taken up the OGC APIs in various communities of practice.

Standard	Initiated	Sprint 1	Sprint 2	Approval	CITE Tests
Features Part 1: Core				2019	
Features Part 2: CRS				2020	
Features Part 3: CQL				2021	
Features Part 4: Transactions				2021	
Records Part 1: Core				2021	
Processes Part 1: Core				2020	
Environmental Data Retrieval				2020	
Tiles Part 1: Core				2020	
Tiles other Parts		IP efforts		2021	
Coverages Part 1: Core				2021	
Maps Part 1: Core				2021	
Common Part 1: Core				2020	
Common Part 2: Collections				2021	
Styles		IP effort		2021	
Routing		IP effort		2022	

Image: OGC API Roadmap (green=complete / orange=in progress / red=not started)

Additional input on the OGC API approach, sprints and other active ties is available on the OGC API webpage.

## 2.4 OGC Standards Roadmap

The [OGC Standards Roadmap](#) shows progress of official OGC Standards (in grey) and Community Standards (in blue).

Proposed Standards	SWG Work / Work Item	OAB Review	OGC-NA Review	Public Review	Prepare for Approval	TC Approval to Vote	TC Vote	PC Vote	Public Release
OGC Abstract Spec Topic 0 04-084	✓	✓	✓	✓	✓	✓	✓	○	
OGC Abstract Spec Topic 2 - Referencing by Coordinates 18-005	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC Abstract Spec Topic 6 - Schema for coverage geometry and functions	○								
OGC Abstract Spec Topic n - Tiling 19-014	✓	✓	✓	✓	✓	✓	✓	○	
OGC CDB 1.2	✓	✓	✓	✓	✓	✓	✓	✓	○
OGC CDB 2.0	○								
OGC CityGML 3.0	○								
Community CityJSON	✓	✓	✓	○					
OGC Common Object Model Container SWG	○								
OGC EO Extension for OpenSearch 13-026/9	✓	✓	✓	✓	✓	✓	✓	✓	○
OGC EO Product Metadata GeoJSON/JSON-LD Encoding 17-003	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC GeoAPI 09-083/4	○								
OGC GeoPackage 1.3 12-128/16	✓	✓	✓	○					
OGC GeoTIFF 19-008	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC GroundwaterML2 v2.3 19-013	✓	✓	✓	✓	✓	✓	✓	✓	○
OGC HDF5 Core 18-043	✓	✓	✓	✓	✓	✓	✓	✓	✓
Community IMDF 19-089	✓	✓	✓	○					
OGC IndoorGML 1.1 19-011	✓	✓	✓	✓	✓	✓	✓	✓	○
OGC MetOcean Profile and Extensions to WCS 2.1 15-045, 15	✓	✓	✓	✓	✓	✓	✓	✓	○
OGC Moving Features Encoding Extension - JSON 19-045	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC OGC API - Common 19-072	✓	✓	✓	✓	○				
OGC OGC API - Coverages	○								
OGC OGC API - Environmental Data Retrieval 19-086	✓	✓	✓	○					
OGC OGC API - Features - Part 1: Core 17-069	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC OGC API - Features - Part 2: CRS by Reference 18-058	✓	✓	✓	✓	✓	✓	✓	○	
OGC OGC API - Features - Part 3: Common Query Language 19-079	○								
OGC OGC API - Features - Part 4: Simple Transactions 20-002	○								
OGC OGC API - Features - Part 5: OpenAPI 3.1	○								
OGC OGC API - Maps	○								
OGC OGC API - Processes	✓	○							
OGC OGC API - Records	○								
OGC OGC API - Styles	○								
OGC OGC API - Tiles	○								
OGC OGC Coverage Implementation Schema - ReferenceableGridCoverage Extension 16-083/6	✓	○							
Community OpenFlight 16.0	○								
OGC OpenSearch GeoJSON/JSON-LD Response Encoding 17-047	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC PipelineML 18-073	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC Semantic Sensor Network Ontology 16-079	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC SensorML 2.1 12-000/1	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC SensorThings API 1.1 - Part 1 18-088	✓	✓	✓	○					
OGC Symbology Conceptual Model: Core 18-067	✓	✓	✓	✓	✓	✓	✓	○	
OGC Time Ontology in OWL 16-071	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC TimeseriesML 1.3 15-042/6	✓	✓	✓	✓	○				
OGC Two Dimensional Tile Matrix Set 17-083	✓	✓	✓	✓	✓	✓	✓	✓	✓
OGC Well Known Text Representation of Coordinate Reference Systems 18-010	✓	✓	✓	✓	✓	✓	✓	✓	✓

## 2.5 Technical / Planning Committee Meetings

As many other events, OGC has also moved its OGC Member Meetings (aka OGC Technical Committee Meetings) to the virtual environment. The previously planned schedule for these meetings is listed below, but of course OGC will adjust where necessary.

Date	Location	Host/Sponsor
7.-11. December 2020 Including a Future Directions session presenting the OGC Testbed-16 outcomes.	Virtual, airwaves	



Feb or March 2021 (or 2022)	Offer from India (TBC)	NRSC, DST, SOI
June 2021	Madrid, Spain (TBC)	
October 2021	Americas	

## 2.6 OGC Tech Trends (November 2020)

[OGC Tech Trends](#) uniquely provides technology assessments based on peer-reviewed material spanning ICT, science, and any technologies supporting the collection, processing, and understanding of geospatial information. Periodic updates include: a refresh of the emerging trends mindmap (that has been shared here in previous updates), analysis of the trends using AI-based [Geospatial Technology Explorer](#), grouping of synergetic trends for analysis, roadmaps for select groupings and a single summary chart depicting the Priority Tech Trends. Through the above mentioned link you can also subscribe to the OGC Tech Trends information.

Why does the OGC track geospatial technology trends?

OGC's position on Innovation (2014): „Develop standards to support evolving and potentially disruptive technologies, community needs and market trends.“

Thus your organization can benefit from the OGC Tech Trends report as a means to align your internal R&D efforts with the emerging trends seen in the industry.

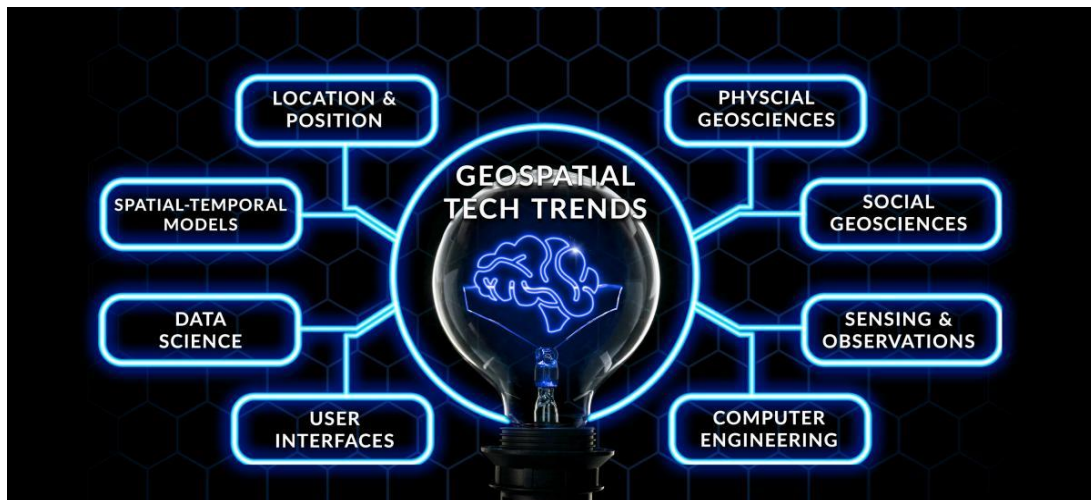


Image: OGC Tech Trends Mindmap

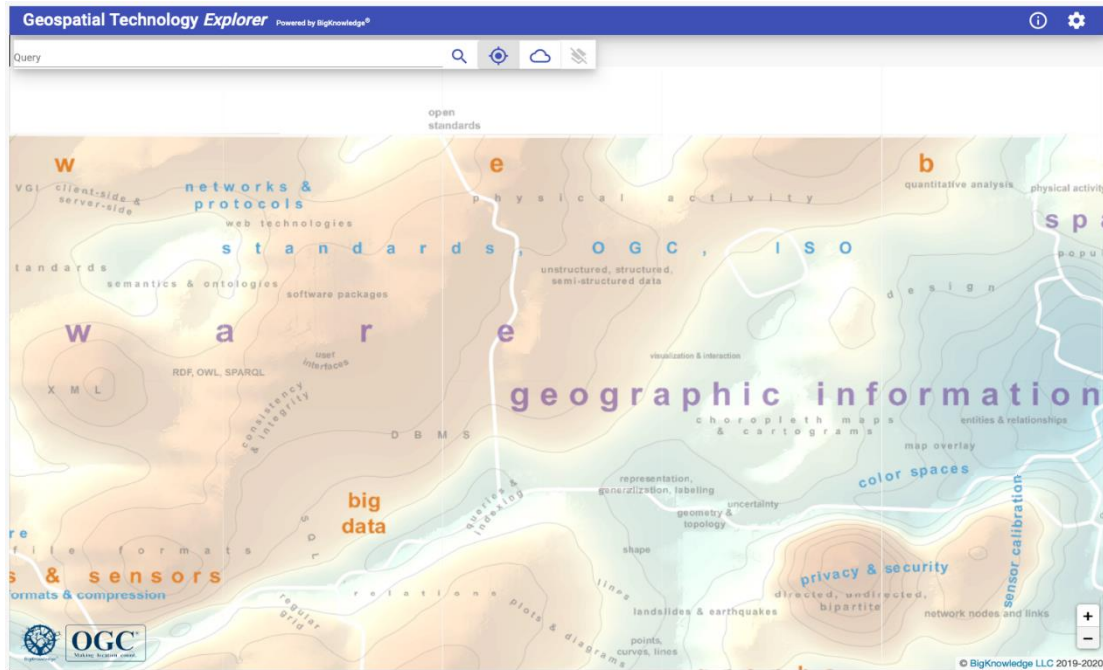


Image: OGC Geospatial Technology Explorer

Points of contact

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### 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.

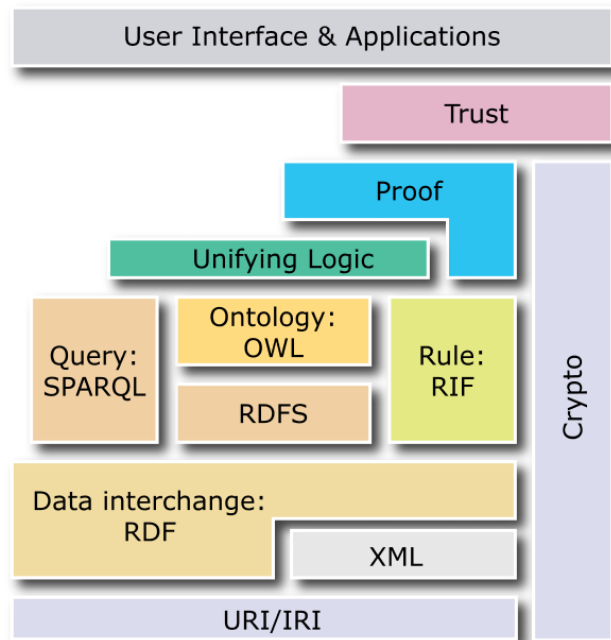
The Resource Description Framework (RDF) supports graphs with labelled directed edges, where the vertices and the edge labels are associated with URIs as globally unique identifiers, that may be dereferenceable to obtain further information, forming a Web of data and metadata.

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.

## News from November 2020

Virtual workshop on AI and Machine Learning organised in August/September 2020, see: <https://www.w3.org/2020/06/machine-learning-workshop/>

[The Web and Networks IG](#) is exploring opportunities arising from the advent of 5G, high bandwidth and low latency networking. [The Web GPU Graphics WG](#) is developing an API for web applications to exploit GPUs from web page scripts. [The Immersive Web WG](#) [3] is creating some basic building blocks in respect to high-performance Virtual Reality (VR) and Augmented Reality (AR) (collectively known as XR) to the open Web via APIs to interact with XR devices and sensors in browsers.

In addition, W3C community groups cover a wide area of topics, including active work on RDF\*, N3, ShEx and SPARQL extensions.

## Points of contact

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