GeoSPARQL 1.1

An almost decadal update to the most important geospatial LOD standard

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1. Motivation to update GeoSPARQL

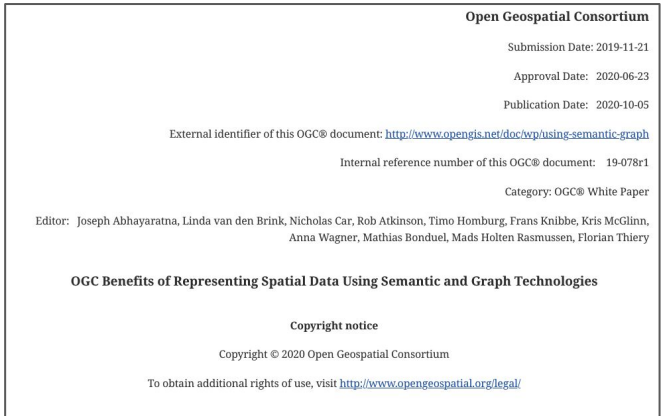
- GeoSPARQL is now relatively old for a well-used web standard
  - Beyond a 5+ year standards cycle revision

- 2017 Spatial Data on the Web WG (SDWWG)
  - Said of spatial 9web) data standards: “A best practice for returning geometries in a specic requested CRS has not yet emerged"
  - Didn’t fix anything

- 2019 OGC Reconstituted to review change requests

1. Motivation to update GeoSPARQL

- 2019 OGC Reconstituted GeoSPARQL SWG
  - Produced an OGC White Paper describing potential updates
  - Produced a SWG Charter to create revision**s** of GeoSPARQL based on:
    - GeoSPARQL 1.0 “Future Work” section
    - SDWWG issues
    - An OGC publicly-available online task tracker



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OGC Benefits of Representing Spatial Data Using Semantic and Graph Technologies

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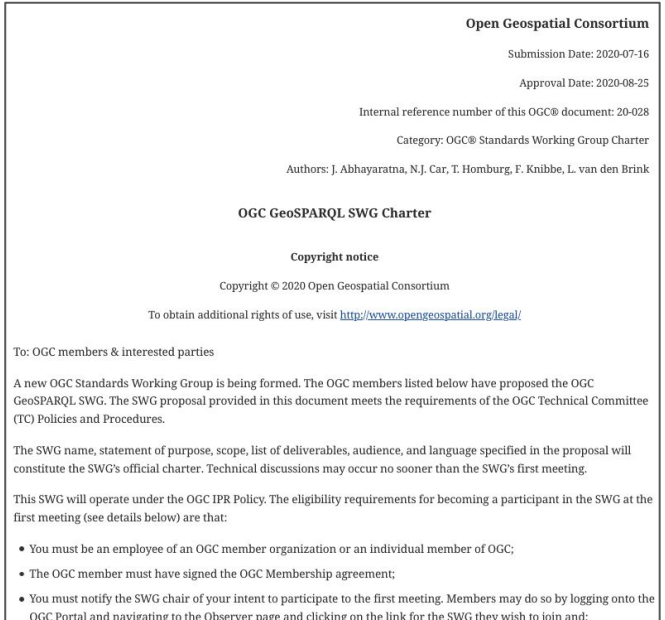

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Authors: J. Abhayaratna, N.J. Car, T. Homburg, F. Knibbe, L. van den Brink

OGC GeoSPARQL SWG Charter

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To: OGC members & interested parties

A new OGC Standards Working Group is being formed. The OGC members listed below have proposed the OGC GeoSPARQL SWG. The SWG proposal provided in this document meets the requirements of the OGC Technical Committee (TC) Policies and Procedures.

The SWG name, statement of purpose, scope, list of deliverables, audience, and language specified in the proposal will constitute the SWG's official charter. Technical discussions may occur no sooner than the SWG's first meeting.

This SWG will operate under the OGC IPR Policy. The eligibility requirements for becoming a participant in the SWG at the first meeting (see details below) are that:

- You must be an employee of an OGC member organization or an individual member of OGC;
- The OGC member must have signed the OGC Membership agreement;
- You must notify the SWG chair of your intent to participate to the first meeting. Members may do so by logging onto the OGC Portal and navigating to the Observer page and clicking on the link for the SWG they wish to join and;

2. GeoSPARQL Revisions

- GeoSPARQL 1.0 - current
- **GeoSPARQL 1.1 - in draft**
- GeoSPARQL 1.2 - potential next
- GeoSPARQL 2.0 - potential later

1.1:

- *additions* to the specification only - entirely backwards-compatible
- major updates the standards' presentation
- some alignments with other ontology structures
- some new geometry literals
- functions tidy-up

2. GeoSPARQL Revisions

- GeoSPARQL 1.0 - current
- GeoSPARQL 1.1 - in draft
- **GeoSPARQL 1.2 - potential next**
- GeoSPARQL 2.0 - potential later

1.2:

- Changes too difficult for 1.1
  - e.g. metrically-refined topological relations - Issue 46
  - Many more vector formats - Issue 16
  - Direct application of Geometry properties - Issue 25

The SWG may go straight to 2.0

2. GeoSPARQL Revisions

- GeoSPARQL 1.0 - current
- GeoSPARQL 1.1 - in draft
- GeoSPARQL 1.2 - potential next
- **GeoSPARQL 2.0 - potential later**

2.0:

- Spatial ontology generalised beyond “geo”?
- Temporal integration (OWL-TIME)?
- Review of interests after 1.1 or 1.2

3a. Updates in GeoSPARQL 1.1 - Profile Declaration

- 1.0 consisted of several informally-linked elements
- 1.1 uses PROF Profiles Vocabulary, PROF, to links the standard's parts, with roles


made by pyLODE 2.10.0

GeoSPARQL 1.1 Profile

A Profile

URI
http://www.opengis.net/def/geosparql

Publisher(s)
Open Geospatial Consortium

Created
2020-10-11

Modified
2020-12-22

Issued
2021-01-01

Version URI
http://www.opengis.net/def/geosparql/1.1

Profile RDF
RDF (turtle)

Has Resource Descriptor(s)
GeoSPARQL Functions & Rules vocabulary
GeoSPARQL Rules in RIF
Generator script for GeoSPARQL Rules in RIF
GeoSPARQL Specification online
GeoSPARQL Specification Document as a PDF
GeoSPARQL Ontology

- 1.0 has been retrofitted with a profile declaration
- 1.0 is a profile of 1.1!
- OGC is using profile declarations to manage their growing *standards baseline*

3a. Updates in GeoSPARQL 1.1 - Profile Declaration

- 1.
- 1.

Validation SHACL file

Description	A Shapes Contraint Language (SHACL) validator provided to validate RDF documents cliaming conformance to GeoSPARQL 1.1
Artifact	https://github.com/opengeospatial/ogc-geosparql/master/1.1/validation.ttl
Role(s)	role:validation
Conforms to	https://www.w3.org/TR/shacl/

Simple Features Vocabulary

Description	An OWL ontology (vocabulary) of the Simple Features geometry types
Artifact	http://schemas.opengis.net/sf/1.0/simple_features_geometries.rdf
Role(s)	role:vocabulary
Conforms to	http://www.w3.org/TR/owl2-rdf-based-semantics/

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A Profile

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growing

3b. Non-specification additions

- RDF validator resource - SHACL
- RIF rules write out in full
  - Not just a template
-

3. Updates in GeoSPARQL 1.1 - New Elements

All new elements listed in the updated specification frontmatter:

https://opengeospatial.github.io/ogc-geosparql/geosparql11/spec.html#_major_changes_between_versions_1_0_and_1_1

Major changes between versions 1.0 and 1.1

Version 1.1 of GeoSPARQL was released approximately 9 years after version 1.0. It contains no breaking changes to 1.0, but does contain additions: whole new profile resources, new ontology elements and new functions. The major changes are given in the tables below.

These new profile resources are resources - documents - that are separate from this specification. The new *profile defintion* lists all the GeoSPARQL 1.1 resources.

New resource	Location
Profile definition	http://www.opengis.net/def/geosparql
GeoSPARQL Rules in RIF	http://www.opengis.net/def/geosparql-rifrules
RDF validation file	http://www.opengis.net/def/geosparql-shapes

These new ontology elements and new functions are normatively defined in this specification document.

New element	Section

3c. Updates - New Classes

- `{Feature, Geometry, SpatialObject}Collection`
  - general collections, not necessarily collected by spatiality
  - Matched OGC API's (and others) need for feature collections
- `SpatialMeasure`
  - "a [scalar] measurement of some dimension of a feature's spatial presence"
  - defers result presentation (units, value etc.) to metrology ontologies, such as QUDT
  - Shortcuts the SDWWG SOSA Ontology `Observation`/`Result` patterning for *spatial* only

3c. Updates - New Classes

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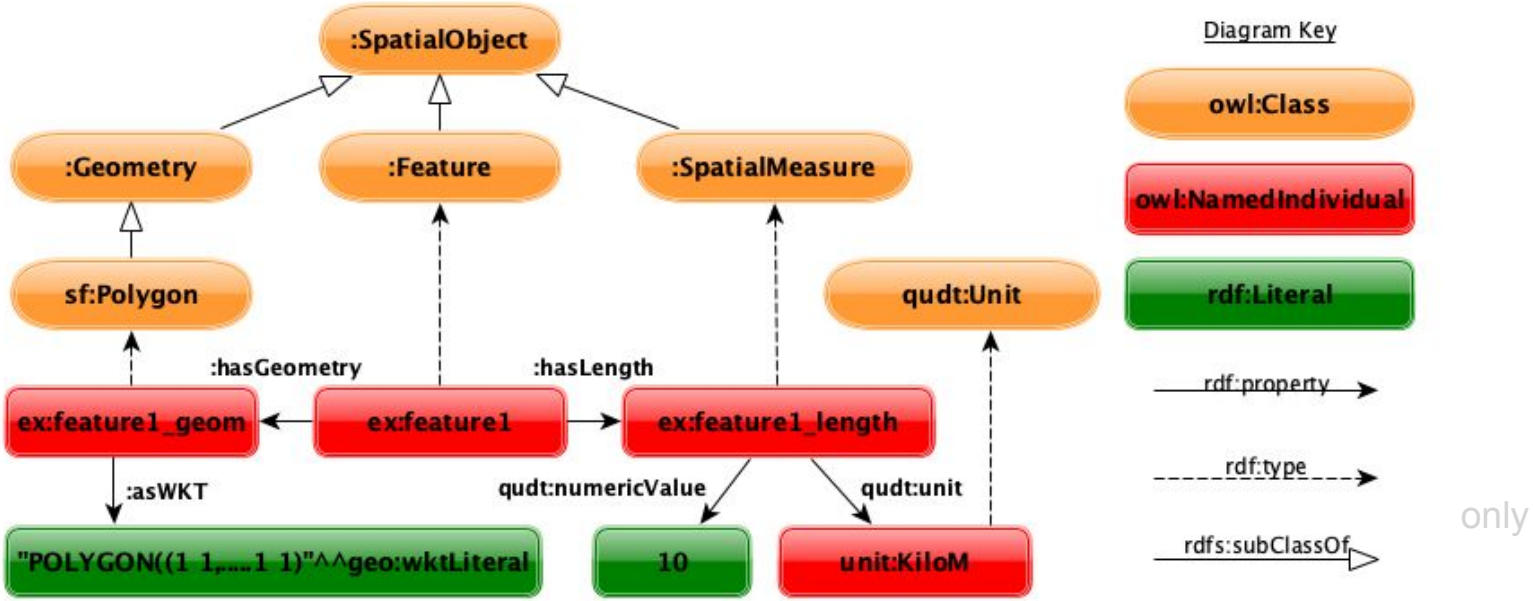


only

3d. Updates - New Properties

For `Feature`:

- Specialisations of `hasGeometry`
  - `hasBoundingBox`, `hasCentroid`
- Spatial measure indicators
  - `hasArea`, `hasLength`, etc...

3e. Updates - New Geometry Literals

- **KML**
  - Fixed CRS, standardised format
- **GeoJSON**
  - Fixed CRS, standardised format
- **DGGS**
  - A family of formats
  - Generic `asDGGS` predicate & `dggsLiteral` Datatype provided
  - Must be specialised per DGGS

3f. Updates - New Functions

New Properties:

- Specialisations of hasGeometry
  - `hasBoundingBox`, `hasCentroid`
- Spatial measure indicators
  - `hasArea`, `hasLength`, etc...
- Non-topological Query Functions
  - `maxX`, `minZ`, etc...
- Spatial Aggregate Functions
  - `BoundingCircle`, `ConcaveHull`, etc...

Several functions missing from the SQL spatial functions from which GeoSPARQL is derived have been added

Example RDF

From the previously-presented Loc-I DR Project

```
<https://linked.data.gov.au/dataset/asgs2016/statisticalarealevel1/60203110007>
      a                  geo:Feature , asgs:StatisticalAreaLevel1 ;
      dcterms:identifier  "60203110007" ;
      dcterms:isPartOf  <https://linked.data.gov.au/dataset/asgs2016/statisticalarealevel1/> ; # Feature Collection
      geo:hasArea [
            a geo:SpatialMeasure ;
            qudt:numericValue       "919200"^^xsd:decimal ;
            qudt:unit               unit:M2 ;
      ] ;
      geo:hasGeometry   <http://gds.loci.cat/geometry/asgs16_sa1/60203110007> ;
      geo:hasGeometry   [
            geo:asGeoJSON "{\"type\": \"Polygon\", \"coordinates\": [[[147.39354862200003,
                        -41.009725971999956], [147.39263499000003,..."^^geo:geoJSONLiteral ;
            geo:asWKT     "<http://www.opengis.net/def/crs/EPSG/0/4326> POLYGON ((147.393548622
                        -41.00972597199996, 147.3940270640001 -41.00776928299996,...^^geo:wktLiteral ;
            geo:asDGGS    "R123 R124 R125 R12346 R12347..."^^eg:auspixLiteral ;
      ] ;
      geo:sfContains    <https://linked.data.gov.au/dataset/asgs2016/meshblock/60105801800>...
      geo:sfWithin      <https://linked.data.gov.au/dataset/asgs2016/commonwealthelectoraldivision/601>...
```

4. Conclusions & Future Work

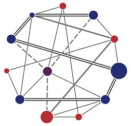
- 1.1 is a much needed “touch-up” and not a revolution

- Completion of 1.1 draft - within 2 months
- Feedback from implementers - 2 more months
- Publication of 1.1
- Assessment of 1.2 or 2.0

All progress at https://opengeospatial.github.io/ogc-geosparql/

Contact

Dr Nicholas Car



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