OGC Coverages:
Governance, Data and Technology, People

A Contribution to the OGC Spatial Data Infrastructure Modernization Project

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Overview

Coverages, as per the term standardized by OGC and ISO, form the largest contribution to today's "Big Earth Data". Additionally, they are continuously faster and less expensive to obtain. Not surprisingly, therefore, any modern SDI must offer means for the management, access, visualization, and analytics of spatio-temporal coverages – means which are efficient, easy to use for both humans and programs, flexible, and scalable, to name but a few of the common requirements.

With the coverage standards in place, OGC and ISO have established a solid, future-proof framework for handling of such Big Data. At the heart is the coverage data model, represented by Abstract Topic 6.1 and the Coverage Implementation Schema (CIS), with the ISO equivalents 19123-1 and 19123-2. This semantic-rich model enables various service models, such as the Web Coverage Service (WCS) suite of standards and the OAPI-Coverages draft. One processing standard stands out in particular, the geo datacube language WCPS.

All of these are actively maintained: 19123-2 / CIS is being enhanced and advanced in the adoption process, WCPS has been adopted into the conceptual standards Abstract Topic 6.3 / ISO 19123-3, a WCS enhancement in OGC is in the final adoption phase, and further to follow.

Therefore, it is indispensable for OGC, in its Spatial Data Infrastructure Modernization Project, to provide comprehensive information about coverage data and service models to the community worldwide.

Fortunately, plenty of material exists already, as is pointed out below.

We propose to set up a façade for Coverages which unites all these existing resources and streamline them into a uniquely comprehensive experience for all user circles, both experts and non-experts. It will encompass lists of standards, educational material with AI support, interactive live demos, and background material. As these resources exist already, it is ensured they will be maintained indefinitely, hence establishing the central point of information on the best use of standards-based coverages.

Existing Resources

- https://external.ogc.org/twiki_public/CoveragesDWG: OGC information turnpike on coverage standards, recent developments, and resources
- https://inspire-wcs.eu: EU INSPIRE adopted Good Practice using OGC CIS and WCS

- https://ai-cu.be: Live demos showing AI-on-coverages
- https://ai-cu.be/chatcube: Multi-lingual chatbot assistant for WCPS query writing
- https://testbed19.rasdaman.com: OGC Testbed-19 outcome offering GeoDataCube and openEO API demos, plus more
- https://earthlook.org: collection of live demos for a large variety of dimensions, use cases, APIs, and clients
- https://seaiceatlas.org: historical Arctic sea ice atlas
- https://cube4envsec.org: 4D datacube showcases for aviation safety use cases
- https://earthserver.world: EarthServer datacube federation with members in US, EU, Taiwan, uniting free and commercial offerings
- https://copernicube.eu: Datacube view on EU Copernicus assets
- https://eo-cube.org: IEEE GRSS datacube service (under construction)
- https://l-sis.org: 200+ scientific publications on datacubes

Response to Call

The above resources (plus further ones to be collected) contribute to the Call facets as follows:

Governance

- Adoption of OGC standards across the EU, with a pragmatic combination of OGC coverage data and INSPIRE metadata
- Harmonization of the large variety of raster data, including timeseries, into standardized coverage representations ready for analysis and recombination (fusion)

Data and Technology

Data Access:

- Data extraction and visualization through a series of the most important OGC standards: WCS, WCPS, WMS, WMTS, OAPI-Coverages, GeoDataCube
- High-end analysis tools using WCPS, a query language which is for datacubes what SQL is for tables: a data language that abstracts away from the pains of programming – shown in use cases from environmental monitoring to aviation safety
- Access to overall 7+ PB of satellite, weather/climate, and many more datacubes

Technical Innovation:

- Petascale space/time datacubes with analytics based on OGC WCPS
- Artificial Intelligence: ChatCUBE and AI-on-datacubes
- Self-updating maps: timeseries of satellites and weather forecasts, eg, from Cube4EnvSec
- Automated data quality/validation tagging: WPCS queries derive flexible quality statements, from summary assessment down to quality heatmaps
- Plug and play interoperability: any sort of data (lightning strikes, radar, optical, weather, DEM, …) can be provided in 110+ data formats, including processed results. Further, all these data can

be combined freely for performing ad-hoc data fusion. This demonstrates that coverages are ARD.

Standards:

- WCS ("most complete implementation", as per EU JRC), WCPS, WMS, WMTS, OAPI-Coverages, openEO, GeoDataCube
- A wide spectrum of interactive demos: earthlook, sea ice atlas, INSPIRE-WCS, etc.
- Location-transparent federation between disparate data sets, from US over EU to Taiwan

People

A large collection of free & open educational material is available, although disparate currently. This should be unified under an OGC umbrella:

- Learning modules about coverage data and services: OGC information turnpike on coverage standards, recent developments, and resources; learning coverages; OGC Testbed-19 outcome offering GeoDataCube and openEO API demos, plus more; Large collection of live demos for a variety of dimensions, use cases, APIs, and clients; 200+ scientific publications on datacubes.
- EarthServer as a peer federation where every node retains full autonomy, yet automatic federated queries are possible; it unites both research and commercial offerings.

Summary

Incidentally, there is a move currently towards a homogenization and (logically) central collection of the above material. The OGC SDI project could become this new focal point.