From requirements to Standards

OGC driving real-world geospatial interoperability
Agenda

• About OGC
• Who and what drives our Standards requirements?
• Some common Standards in wide use
• Emerging trends
What is OGC?

A hub for thought leadership, innovation, and standards for all things related to location

Our Vision
Building the future of location with community and technology for the good of society

Our Mission
Make location information Findable, Accessible, Interoperable, and Reusable (FAIR)

Our Approach
A proven collaborative and agile process combining consensus-based standards, innovation project, and partnership building
## Who Are Our Members?

### Commercial
- Business Development
- Competitive Technical Advantage
- Global: Brand Exposure
- Funding for Innovation

### Government
- Innovation & Market Support
- Trusted Advice
- Support & Certification
- International Partnerships
- Operational Policy

### Research & Academia
- Applied Research Partners
- Funding for Innovation
- International Collaboration
- Citations
Who and what drives our Standards requirements?
Working Groups

Domain Working Group: Understand real-world requirements, gather expertise

Standards Working Group: Take the requirements and distill to a testable Standard
Coordinate with OGC Alliance Partners
• TC 211 – Geography and Geomatics
• TC 204 – Intelligent Transport Systems
• TC 59 SC 13 - Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)
• TC 20 SC 16 – Unmanned Aircraft Systems
• … and several more
OGC Innovation-Standardization continuum

Experiment in context

- Call for Sponsors
- Identify Project
- Create public call
- Select best members
- Executive Project
- Generate Results

Innovation Cycle

Use cases and requirements

Solve discrete problems

- DWG discussion
- SWG formation
- Standards development
- DWG/SWG Presentation
- Formulation of enhancements
- Interest gathering

Standardization Cycle

Solve discrete problems

- DWG discussion
- SWG formation
- Standards development
- DWG/SWG Presentation
- Formulation of enhancements
- Interest gathering

Use cases and requirements

Solve discrete problems
Some common Standards in wide use
# Discovery

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## OGC APIs

- OpenGIS 
- WFS (Web Feature Service)
- WCS (Web Coverage Service)
- OpenLS
- WPS (Web Processing Service)

## Data Models and Encodings

### Domain-specific

- CityGML
- CityJSON
- IndoorGML
- IMDF (Indoor Mapping Data Format)
- LandInfra / InfraGML
- PipelineML
- LAS
- TimeSeriesML
- WaterML

### General

- Simple Features
- GML (Geography Markup Language)
- KML
- Moving Features
- OpenGeoSMS
- GeoXACML
- Time Ontology on OWL
- SLD (Styled Layer Descriptor)
- O&M (Observations & Meas.)

### Spatial Reference Systems

- GeoTIFF
- CRS WKT
- Filter Encoding
- GMLJP2
- 2D Tile Matrix Set
- Symbology Encoding
- Symbology Core

## Sensors

- SensorThings API
- SensorML
- SWE Common (Sensor Web Enablement)
- SOS (Sensor Observation Service)
- SPS (Sensor Planning Service)
- PUCK
- Sensor Network Ontology

## Abstract Specification
Without these invaluable standards we would certainly find working with our huge customer base a much more challenging task. We see working with groups such as the OGC, W3C, WMO and ISO as key to the successful delivery of our services and will continue to invest in this important area.”

Richard Carne – Head of Applications Development, Met Office, January 29, 2014
OGC APIs: deployment model example

User: just want features in WGS 84, but want to query

Feature: CQL
Feature: Core
Feature: CRS

User: need features supporting other CRSs

User: tile it up and make it work on my phone

Data
- Features: Transactions
- EDR

Tiles
Maps
Coverages

User: I am a fire incident commander: give me everything
OGC API – Environmental Data Retrieval

NOAA
GeoPackage: Raster Maps, Images and Feature Data in One File

Raster Maps: Small – Large Scale

Imagery: Low – High Resolution

File Pyramids: 24 zoom levels

Feature Data

Landsat imagery
Intermediate levels
Aerial imagery

Single File Sqlite Database
containing all data for direct-use on mobile platforms & handheld devices
OGC CityGML Standard: Solar Energy Production Potential Analysis

- Solar power potential and CO2 offset potential computed for the 550,000 buildings in the Berlin 3D city model.

- City Model is based on OGC CityGML Standard
IndoorGML: Integrated Outdoor / Indoor location/navigation

Outdoor & Indoor 3D Navigation

Based on Dual Location Devices for each environment
Properly manage diversified water information including internal and external water.
Emerging trends
Artificial Intelligence in Geoinformatics

OGC potentiality as a pivotal role to support Machine Learning, Deep Learning, and Artificial Intelligence systems of/by/for Geospatial data

From automated intelligence to assisted, augmented, and autonomous intelligence
Training Data Markup Language for AI candidate Standard

Remote Sensing Machine Learning Scenarios:

- In the scene level, e.g., the wildfire scene classification, the sample content of which includes an image and its corresponding binary label.

- In the object level, e.g., the building detection, the sample content of which includes an image with several polygons indicating the position of buildings.

- In the pixel level, e.g., the landcover classification, the sample content of which includes the Earth Observation (EO) imagery and the landcover class of each pixel.
TrainingDML-AI model

Core concepts

UML model
PyTDML: A Python package allowing documentation, storage, and sharing of geospatial training datasets in a unified data model (TDML).
Analysis Ready Data – joint with ISO/TC211

- The concept of Analysis-Ready Data (ARD) as developed by CEOS
- Definition of CEOS ARD
  - CEOS Analysis Ready Data (CEOS ARD) are satellite data that have been processed to a minimum set of requirements and organized into a form that allows immediate analysis with a minimum of additional user effort and interoperability both through time and with other datasets
- ARD is a CEOS-wide initiative
  - CEOS has developed a number of ARD specifications
  - CEOS has set up ARD Oversight Group to manage the development of CEOS ARD specifications
ARD Standard parts

• Envisioning OGC-ISO ARD standard will be a multi-part
  • Part 1 Geospatial ARD framework
  • Part 2 EO ARD for Land
  • Part 3 EO ARD for Ocean
  • Part 4 EO ARD for Atmosphere
  • Part 5 Earth System Model ARD
  • Part 6 Geospatial ARD service
  • More parts….
PubSub

- OGC Standards Publish/Subscribe Interface Core and Soap Binding Extension from 2015
- Some work done on RESTful encoding
- Mostly complete assessment of MQTT protocol work
- OGC API – Environmental Data Retrieval and OGC API - Records planned extension for PubSub
- PubSub Sprint planned for 2023 or 2024

Google’s PubSub model
Use PubSub for Tile updates?

TILING INTERFACES CODE SPRINT

fce Featuring OGC API - Tiles, Maps, NSG & DGIWG WMTS profiles and more
Portrayal

• The legacy Styled Layer Descriptor and Symbology Encoding Standards are being replaced by a new model
• OGC Symbology Conceptual Model: Core (SymCore), published 2020
  • Conceptual basis for defining symbology to be used in portrayal
• OGC API – Styles in work
  • Discover and apply styles via an API
Portrayal – next steps

• Portrayal workshop at upcoming OGC Member Meeting
  • Goal is to roadmap symbology and portrayal Standards activities
  • Better cooperate with International Cartographic Association (ICA)
• OGC participating in 2023 ICA meeting in Cape Town
Community
500+ International Members
110+ Member Meetings
60+ Alliance and Liaison partners
50+ Standards Working Groups
45+ Domain Working Groups
25+ Years of Not for Profit Work
10+ Regional and Country Forums

Innovation
120+ Innovation Initiatives
380+ Technical reports
Quarterly Tech Trends monitoring

Standards
65+ Adopted Standards
300+ products with 1000+ certified implementations
1,700,000+ Operational Data Sets
Using OGC Standards

Thank You

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