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Next generation OGC standard for cartographic portrayal interoperability

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Abstract:

The OGC Styles and Symbology Standard Working Group is developing a new candidate OGC Standard for Styles and Symbology (Bocher et al., 2023) to improve cartographic portrayal interoperability.

OGC Styles and Symbology Model and Encodings - Part 1: Core ("SymCore" 2.0) defines a Conceptual Model, a Logical Model and Encodings for describing symbology rules for the portrayal of geographical data. This candidate standard is intended as a successor to the combination of Filter Encoding (Vretanos, P., 2005), Symbology Encoding standard (SE 1.1) (Mueller, 2007) and Styled Layer Descriptor (SLD 1.1) (Lupp, 2007), and an evolution of the OGC Symbology Core Conceptual Model ("SymCore" 1.0) (Bocher and Ertz, 2020). The standardization targets of this candidate standard are symbology encodings and cartographic rendering engines. The model features a rich and extensible expression system used by both selectors controlling whether a particular symbology rule is to be applied by the rendering engine, as well as by parameter values to define symbolizer properties.

The candidate standard specifies requirements allowing to define interoperable cartographic style sheets applicable to portray geospatial datasets whether they are accessed offline, such as data stored in an OGC GeoPackage (Figure 1), or accessed online (Klopfer, 2020), such as with the Web Feature Service (WFS) or the Web Coverage Service (WCS), and more recently with the OGC API family of standards, often described and documented using the OpenAPI specification.

A model for the portrayal of geographic data is defined at both the conceptual and logical levels, in a modular manner through the use of separate requirements classes and well-defined extension mechanisms. A minimal core describes an extensible framework for defining styles consisting of styling rules selected through expressions and applying symbolizers configured using properties. This provides two extension mechanisms that can be used by the additional requirements classes defined in this candidate standard as well by those that may be introduced in future extension parts to define additional portrayal capabilities: new properties can be added to the *Symbolizer* class while defining their associated behavior, while new derived *Expression* classes can also be defined.

Figure 1. Vector features and elevation data stored in a GeoPackage styled with the *"SymCore" 2.0* conceptual model © OpenStreetMap Contributors, Viewfinder Panoramas

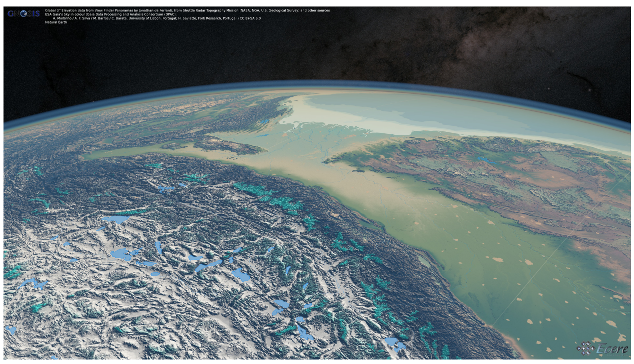

Figure 2. Vector features and elevation data styled with the *"SymCore" 2.0* conceptual model displayed in a 3D view Natural Earth, Viewfinder Panoramas, ESA Gaia Sky in Colour

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The candidate standard also defines a number of additional conformance classes covering a large number of essential portrayal use cases for symbolizing both vector data and coverage data (Figure 2). Several scenarios of varying complexity and the associated requirements classes enabling them are illustrated in an annex. By defining requirements organized in classes starting from very simple and growing in complexity to support more advanced portrayal use cases, encodings and rendering engines can more easily conform to the relevant aspects based on their supported capabilities, improving portrayal interoperability while also enabling the standardized definition of richer symbology.

Finally, the candidate standard defines two encodings for the logical model: CartoSym-JSON based on JSON which can be readily parsed by JSON parsers, as well as CartoSym-CSS, a more expressive encoding better suited for hand-editing inspired from W3C Cascading Style Sheets (CSS) and related cartographic symbology encodings (Saeedi, 2019) e.g., CartoCSS, MapCSS, GeoCSS, CMSS (Jacovella-St-Louis, 2019). The syntax for expressions in CartoSym-JSON and CartoSym-CSS extends, respectively, the *cql2-json* and *cql2-text* encodings defined by the OGC Common Query Language (CQL2) (Vretanos and Portele, 2023) for use with the OGC API family of standards. A draft JSON schema is available for CartoSym-JSON, while a BNF grammar is being developed for CartoSym-CSS. Examples of both are provided within the document and as supplementary material. Additional encodings can be defined that can conform to the logical model, and existing encodings can be mapped fully or partially to the conceptual model defined in this candidate standard. For encodings that fully cover the capabilities defined within the conceptual model, such as CartoSym-JSON and CartoSym-CSS, portrayal information for the supported requirements classes could be losslessly converted to any other fully conformant encoding by conversion tools, such as the GeoStyler open-source project.

In contrast to "SymCore" 1.0, the newer version is more concretely and readily implementable, better reflecting the fact that it is an OGC Implementation Standard, and recognizing that for rendering engines to implement this standard and for new or existing encodings to be mapped to its conceptual model, the candidate standard needs to be sufficient to cover the essential portrayal use cases of both vector and raster data and needs to define clear extension points. The included encodings for the logical model allow to express all of the symbology capabilities defined in this candidate standard and should greatly facilitate interoperability and encourage implementation.

In summary, "SymCore" 2.0 concretely realizes the objectives of its predecessor (Bocher and Ertz, 2018):

- provide the flexibility required to achieve adequate symbology rules for a variety of information communities; e.g., aviation symbols, weather symbols, thematic maps, etc.; and
- achieve high-level styling interoperability without encoding dependencies, by allowing to define multiple encodings of the same logical model, as well as providing a framework to map the logical models used by other encodings to the one defined in this candidate standard through its conceptual model.

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