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Introducing libCartoSym, an open-source software library for transcoding portrayal rules between different encodings based on OGC Cartographic Symbology 2.0

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Abstract:

LibCartoSym (https://github.com/ecere/libCartoSym) is a new Free and Open-Source Software library written in eC (https://ec-lang.org) implementing the Open Geospatial Consortium (OGC) Cartographic Symbology – Part 1: Core Model and Encodings version 2.0 (CartoSym 2.0) candidate Standard (Bocher et al., 2025). The library is based on the CartoSym conceptual model and allows parsing and encoding portrayal rules defined using the CartoSym-CSS and CartoSym-JSON encodings. Object-oriented bindings for libCartoSym will be available in C, C++ and Python, leveraging an automated binding generating tool (bgen). In addition to reading and writing CartoSym encodings, the library will support importing and exporting portrayal rules defined using additional encodings, including:

- OGC Styled Layer Descriptor (SLD) (Lupp, M., 2007) / Symbology Encoding (SE) (Mueller, M., 2007)
- Mapbox GL (https://docs.mapbox.com/style-spec) / Map Libre Styles (https://maplibre.org/maplibre-style-spec).

Since SLD/SE and Mapbox GL predate CartoSym 2.0 and do not fully align with the conceptual model, transcoding will always be lossy and approximate. LibCartoSym aims to provide the best conversion results, which are expected to improve over time with increased adoption and contributions. Progress towards importing Mapbox GL styles was made during the Releasable Basemap Tiles (RBT) in GeoPackage Code Sprint (Jacovella-St-Louis, 2025). The transcoding capabilities aim to support the portrayal interoperability goals of CartoSym 2.0 (Jacovella-St-Louis et al., 2023) which are aligned with those of its conceptual predecessor, SymCore 1.0 (Bocher and Ertz, 2020). This will provide a bridge to existing rendering engines, such as GeoServer and Map Server, which currently support portrayal rules defined using OGC SLD / SE. This bridge will help facilitate the adoption of CartoSym 2.0 for next generation OGC APIs for Web mapping (Hobona et al., 2023), such as OGC API – Maps (Masó and Jacovella-St-Louis, 2024) and OGC API – Tiles (Masó and Jacovella-St-Louis, 2022).

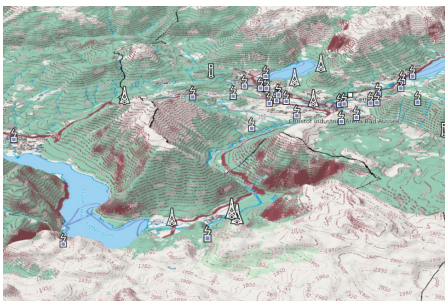

Figure 1. RBT and styles provided by US AGC including data © OpenStreetMap Contributors portrayed using CartoSym 2.0 conceptual model

Figure 2. Natural Earth and digital elevation model from Viewfinder Panoramas (SRTM/USGS, Jonathan de Ferranti) styled using CartoSym 2.0

These Web APIs enable clients to request server-side rendered maps, using standardized interfaces. Implementations of OGC API – Styles (Portele, 2025), which manages styles repositories and provides interfaces to transcode styles between different encodings, could also benefit from libCartoSym to implement the transcoding capability. The combination of OGC API – Maps and OGC API – Styles enables clients to select a specific style when requesting a

map. For offline use cases, CartoSym-CSS/JSON style sheets could also be included in data containers such as OGC GeoPackage. The GeoPackage Extension for Portrayal (Yutzler and Jacovella-St-Louis, 2025) defines this capability in a manner agnostic of the encoding.

Since the CartoSym encodings extend the OGC Common Query Language (CQL2) (Vretanos and Portele, 2024), the library will also include support for parsing and writing expressions encoded in both:

- CQL2-Text, with geometry encoded in Well-Known Text (WKT) (Herring, 2011), used by CartoSym-CSS;
- CQL2-JSON, with geometry encoded in GeoJSON (Butler et al., 2016), used by CartoSym-JSON.

Additional functionality related to implementing CartoSym 2.0 in rendering engines will also be provided in related open-source libraries being developed in parallel. These libraries will facilitate the run-time evaluation of expressions, including spatial relation queries based on the Dimensionally Extended-9 Intersection Model (DE-9IM) (Herring, 2011) and the rendering of map data according to symbology rules.

As an example use case in a government agency, the OGC CartoSym standard is being considered for enabling wider international interoperability of modern cartographic portrayal by mapping the symbology description of the Swiss national standard INTERLIS (Géonormes et al., 2024) to CartoSym. The Switzerland geospatial standardization body (https://geostandards.ch) evaluated the feasibility of mapping the INTERLIS portrayal capabilities to the candidate CartoSym standard. Transcoding capabilities such as those offered by libCartoSym will facilitate implementation.

In summary, libCartoSym aims to become one of the first reference implementation of the OGC CartoSym 2.0 conceptual model. The library supports parsing and writing the CartoSym-CSS and CartoSym-JSON encodings, with the ability to transcode losslessly between the two. libCartoSym also implements OGC CQL2, including both CQL2-Text and CQL2-JSON. In addition, the library will provide the ability to import and transcode styles from other encodings, such as OGC SLD/SE and Mapbox GL styles. With these capabilities, libCartoSym is intended to offer a simple and frictionless path for integrating CartoSym 2.0 support into both open-source and commercial software implementing next generation OGC APIs. CartoSym enables interoperable description of cartographic portrayal rules.

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