

2. GEOSPATIAL DATA MODELLING AND STANDARDS

Geodesists invented a lot of standards to exchange their geospatial data, e.g. EPSG codes for projections. Starting in the Geodesy 2.0 era, standards for digital data modelling were created and applied to enable interoperability, data exchange and reusability, e.g. GML (Portele 2007), OGC web services, GeoJSON, GeoSPARQL and Neo4J spatial functions (Agoub, Kunde and Kada 2016). The OGC provides a variety of web service definitions, in order to provide, process and display geospatial data to the Geospatial community. WFS Services (Vretanos 2005) give access to vector datasets, WCS Services (Benedict 2005) enable the download of raster data, WMS Services (Wenjue, Yumin and Jianya 2004) offer pre-rendered maps and CSW Services (Nogueras-Iso et al. 2005) provide an overview of different available aforementioned web service types. A common problem in the geospatial sciences is that those services are not interlinked among each other, except for the CSW services. In particular, links inside datasets to other datasets are not possible, only external links to an entire dataset can be provided. GeoJSON is a community-driven data format that displays vector data which emerged in 2008 from the need to create a simple JSON-based (Severance 2012) format for sharing geospatial data on the web (Butler et al. 2016). GeoJSON became a de-facto web standard which is today often used as a means of geospatial data provision for web applications such as Leaflet or JavaScript-based frameworks, or as a common return type in OGC web services. This standard defines geospatial features and Feature Collections whereas a feature is comprised out of a geometrical part which includes geo-coordinates, the geometry type and a list of key/value pairs describing the properties of the respective feature. Several extensions have been proposed for GeoJSON, such as GeoJSON-LD for linked data and GeoJSON-T for temporal aspects. Recently, the CoverageJSON format has been standardised to represent coverages and their annotations in JSON. The GeoSPARQL standard (Battle and Kolas 2012) defines both a vocabulary to encode geospatial features and a query extension to the SPARQL query language (Prud'hommeaux and Seaborne 2008) allowing the definition of geospatial relations.