The state of Vector tile servers

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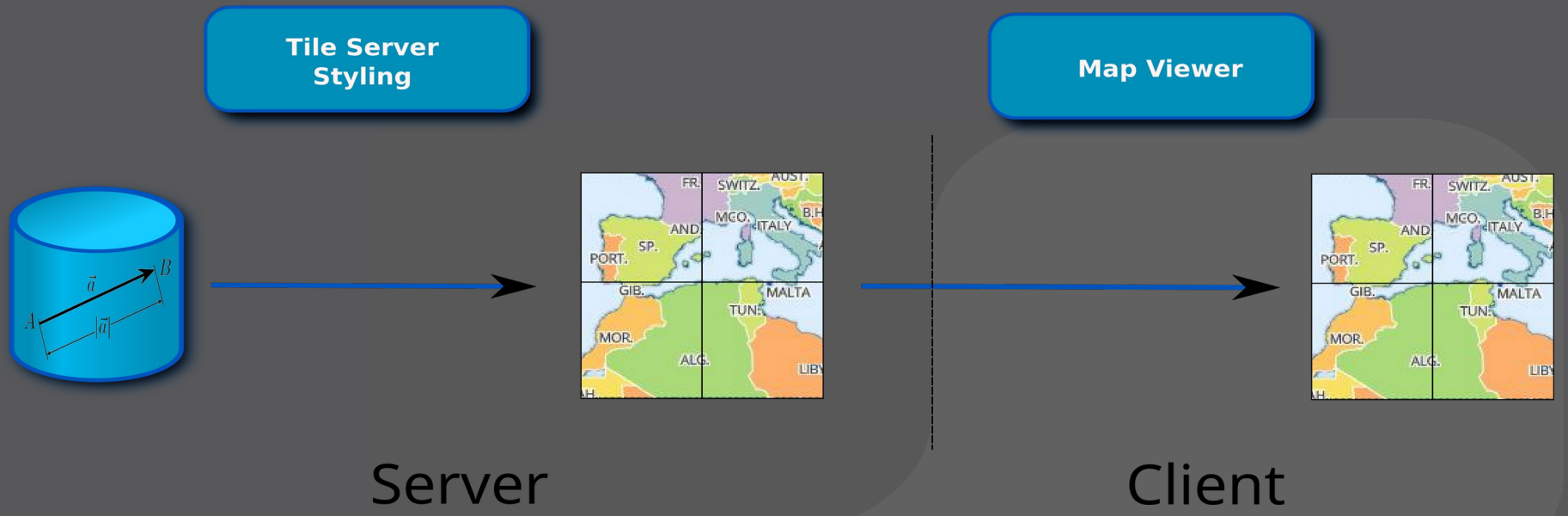
SOURCEPOLE
Linux & Open Source Solutions

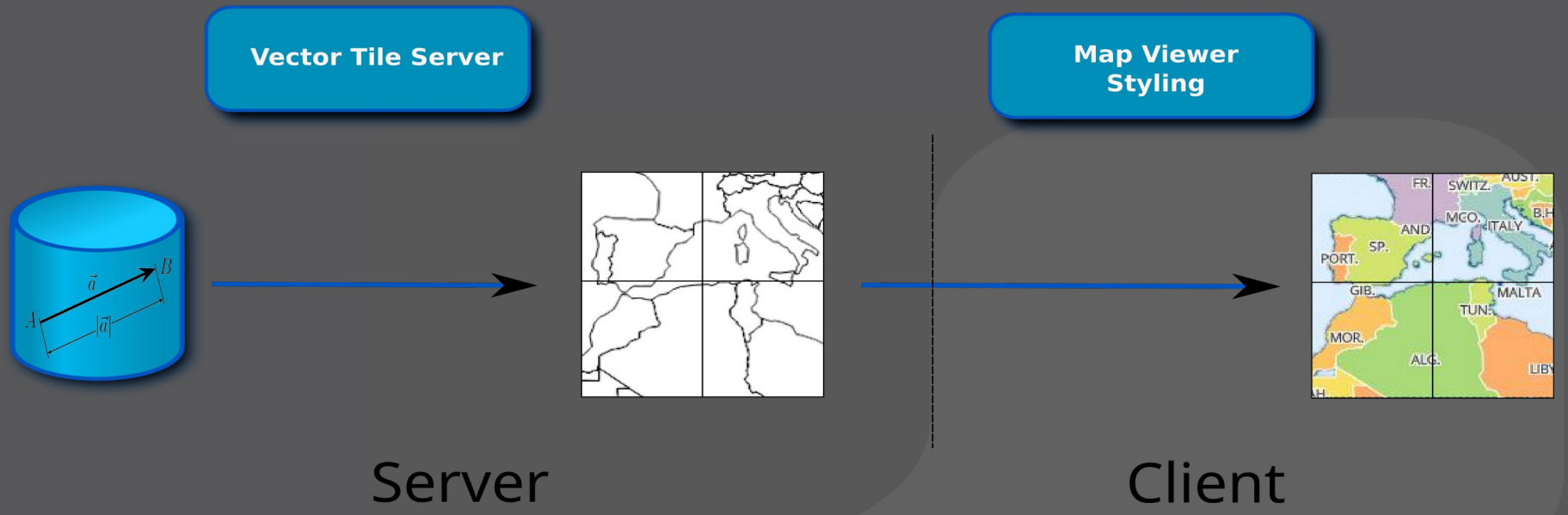
Raster tile service

- Example: WMTS



Vector tile service

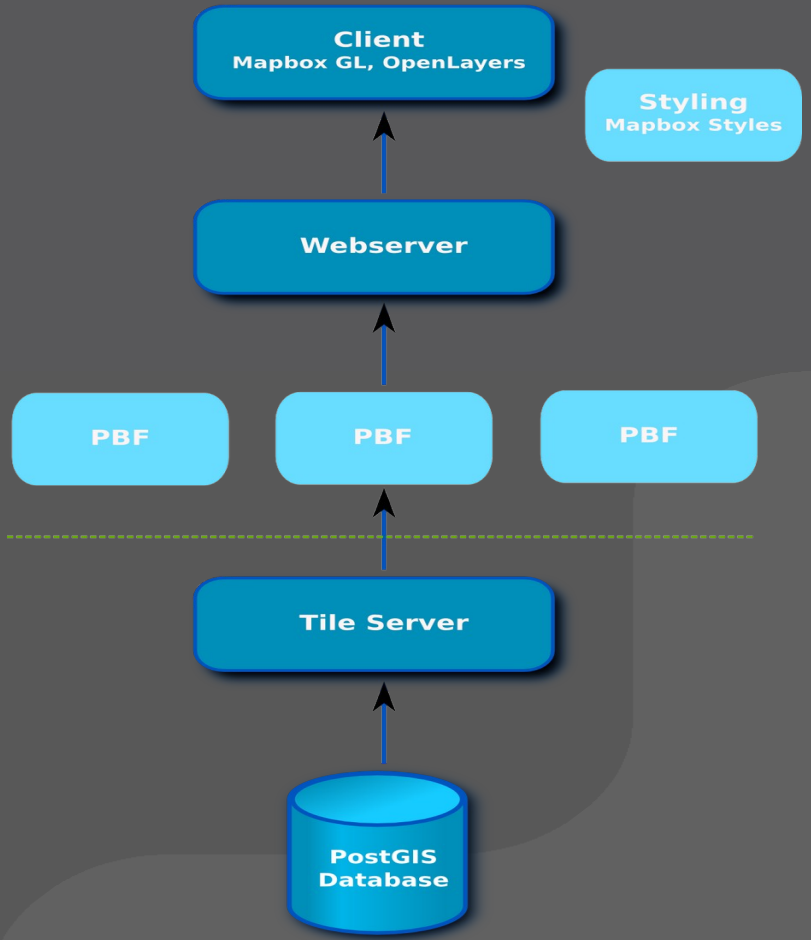
- Example: MVT



Vector tile creation

- Read geodata within tiles borders
- Clip geometries
- Simplify geometries
  - Polygons: e.g. SnapToGrid
  - Lines: e.g. Douglas-Peucker
- Fix invalid geometries
- Encode to MVT (Protobuf) format

Vektor tile stack with generator+webserver



Vektor tile servers

https://github.com/mapbox/awesome-vector-tiles

- CLI: 18
- Server: 29

Servers

- ArcGIS Online - Supports serving vector tiles and rendering in the mapping application powered by the ArcGIS API for JavaScript
- Cloud-Tileserver - Serve vector tiles with AWS. Includes a Lambda-Function written in Typescript to dynamically create vector tiles with postgis. Terraform configuration and step-by-step tutorial is also included.
- ClusterBuster A Mapbox Vector Tile (MVT) map tiling server with built-in clustering and filtering.
- djangorestframework-mvt - A Django REST Framework extension for creating views that serve Postgres data as tiles. Tiles can be paginated and filtered by their properties.
- GeoServer - java web application for sharing and editing geospatial data. Vector tile extension available since GeoServer 2.11.
- go-vtile-example - An example server written in Go
- Hastile - Haskell web server using PostGIS to deliver vector tiles.
- Kartotherian Wikipedia tile server with Tilerator backend tile pre-generator
- MapServer - Open Source platform, written in C, for publishing spatial data and interactive mapping applications to the web. MVT output available since version 7.2
- martin - is a PostGIS vector tiles server suitable for large databases.
- mbtileserver - A simple Go-based server for map tiles stored in mbtiles format.
- OpenMapTiles - Set of open-source tools for self-hosting of OpenStreetMap maps in more than 50 languages. It provides both raster as well as vector tiles, WMS and WMTS services for GIS programs, support for JavaScript viewers and mobile SDK.
- OSM Scout Server - Maps server providing vector and raster tiles, geocoder, and router. Designed to be used on Linux (mobile and PC) to provide offline maps; written in C++
- Portal for ArcGIS - Supports serving vector tiles and rendering in the mapping application powered by the ArcGIS API for JavaScript
- postserve - A small Python based tileserver using ST_AsMVT and ST_AsMVTGeom to generate vector tiles on the fly. Designed for use with PostGIS 2.4 and the OpenMapTiles project
- t-rex - MVT server in a single executable written in Rust. Serves tiles from PostGIS supporting custom tile grids.
- Tegola - is a vector tile server delivering Mapbox Vector Tiles with support for PostGIS and GeoPackage data providers.
- tessella - lightweight Node.js Mapbox Vector Tiles server. Inspired by tessera.
- tessera - Supports serving and rendering vector tiles. Uses the same core libraries as Mapbox Studio.
- tileserver Mapzen Vector Tile Service.
- tileserver-gl Vector and raster maps with GL styles. Server side rendering by Mapbox GL Native. Map tile server for Mapbox GL JS, Android, iOS, Leaflet, OpenLayers, GIS via WMTS, etc.
- tilesplash - A light and quick nodejs webserver for serving topojson or mapbox vector tiles from a postgis backend
- TileStache added support for Mapbox Vector tiles via .pbf extension requests.
- tilestrata - with tilestrata-vt, it can generate Mapnik Vector Tiles; with tilestrata-postgismvt, it can serve Mapbox

Features / Checklist

- Input data formats
- Output formats (Files, S3, MbTiles)
- Modes: Generator, Tileserver
- Clipping, simplification
- Analytics for tile optimization
- Non-Mercator projection
- Performance, scalability

Node.js Applications

- **Kartotherian (2013)**
  - Developed for Wikimedia
  - https://github.com/Qwant/kartotherian
  - In: TileLive Out: Pbf, Raster tiles
- **Tileserver GL (2016)**
  - Server for previously generated MVT
  - In: MBTiles Out: Pbf, GeoJSon, Raster tiles
  - Raster tiles with Mapbox GL Native

OpenStreetMap Tile Stacks

- **OpenMapTiles (2015)**
  - Imposm, Mapnik, Postserve, Tileserver GL
- **Tilemaker (2016)**
  - C++/Lua
  - Input: OSM pbf

Standalone Applications

- **Tippecanoe (2015)**
  - Generator, C++
  - In: GeoJSON, Geobuf, CSV Out: File, MBTiles
- **Tegola (2016)**
  - Generator + Tileserver, Go
  - In: PostGIS + GeoPackage Out: File, S3, Redis, Azure Blob
- **T-rex (2017)**
  - Generator + Tileserver, Rust
  - In: PostGIS + GDAL Out: File, S3
- **GDAL (2018)**
  - Generator, C++
  - Output: Files, MBTiles

Full-Stack (Raster+Vector tiles)

- GeoServer (2017)

- UMN Mapserver (2018)

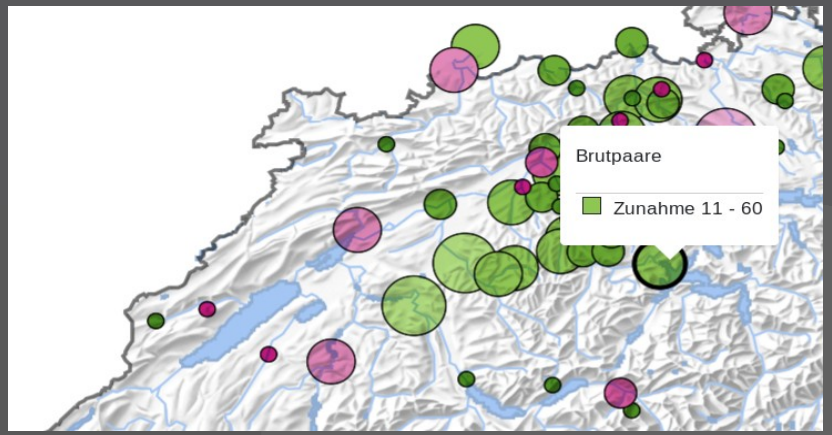
PostGIS ST_AsMVT Tileservers

- **Postserve (2017)**
  - Python → openmaptiles-tools
- **Martin (2018)**
  - Rust
- **pg_tileserv (2020)**
  - Go

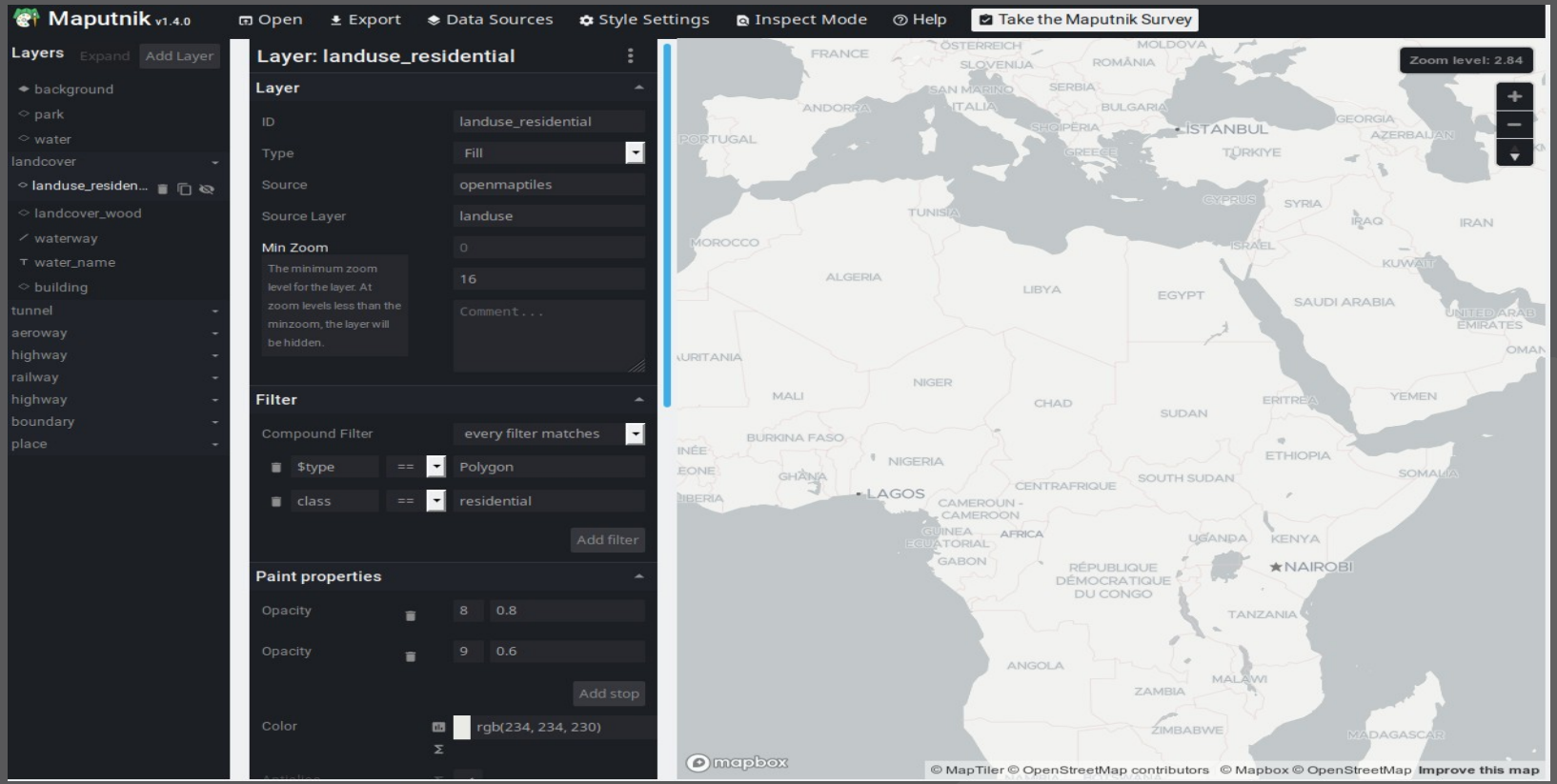
- **Tileserve mode only!**

Mapbox GL JSON Styles

```
{
  "source": "birddata",
  "source-layer": "change_increase",
  "type": "circle",
  "paint": {
    "circle-radius": {
      "property": "code",
      "stops": [
        [1, 5],
        [2, 10],
        [3, 15],
        [4, 20]
      ]
    },
    "circle-stroke-width": ["case",
        ["boolean", ["feature-state", "hover"], false],
        3,
        1
    ],
    "circle-stroke-color": "#000000"
  }
},
```



Styling GUI: Maputnik



https://github.com/maputnik/editor

MapLibre

https://maplibre.org/

- Open-Source fork of Mapbox GL 1.x
- Mapbox GL JSON Styles
- WebGL Rendering
- 3D rendering
- Mercator-only

OpenLayers

http://openlayers.org/

- Support for WMTS, WFS, etc.
- Support for Non-Mercator CRS
- Conversion of GL-Styles to OL-Styles
- Uses browser canvas-API

Styling / Viewer

- **Style Editor**
  - Maputnik
  - (Fresco)
- **Viewer:**
  - MapLibre GL (Mapbox GL JS)
  - OpenLayers (ol-mapbox-style)
  - Leaflet (MapLibre/mapbox-gl-leaflet plugin)
  - deck.gl (MVTLayer), kepler.gl
  - Tangram
  - harp.gl

Whishlist

- **Better support for optimizing tiles**
  - Statistics for tile size and content
  - Feedback loop styling <-> tile generation
- **Automatic clustering/generalization**
- **Server side labelling engine**
- **Printing support**
- **Tracing**
- **Standardisation (OGC)**

Thank you!

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