오픈소스 실행구조 분석 세미나
Mapbox GL JS

2021.07.11 박정수

Mapbox

Maps
Smooth, fast, real-time maps

Mapbox GL JS
JavaScript library for vector maps

Boundaries
4 million global boundaries

Navigation SDK
Turn-by-turn routing

Static Maps
Display your maps anywhere

Mobile Maps SDK
The most compelling map experience

Studio
Design custom maps

Mapbox Tiling Service
Transform geo data into vector tiles

Vision
Second set of eyes for your car

Data
Build with Mapbox data

Movement Data
Dataset of population movement

Atlas
Mapbox on-premises

Search
Search points-of-interest,
addresses, and places

Dash
Beautiful maps, live traffic, music
and voice for cars
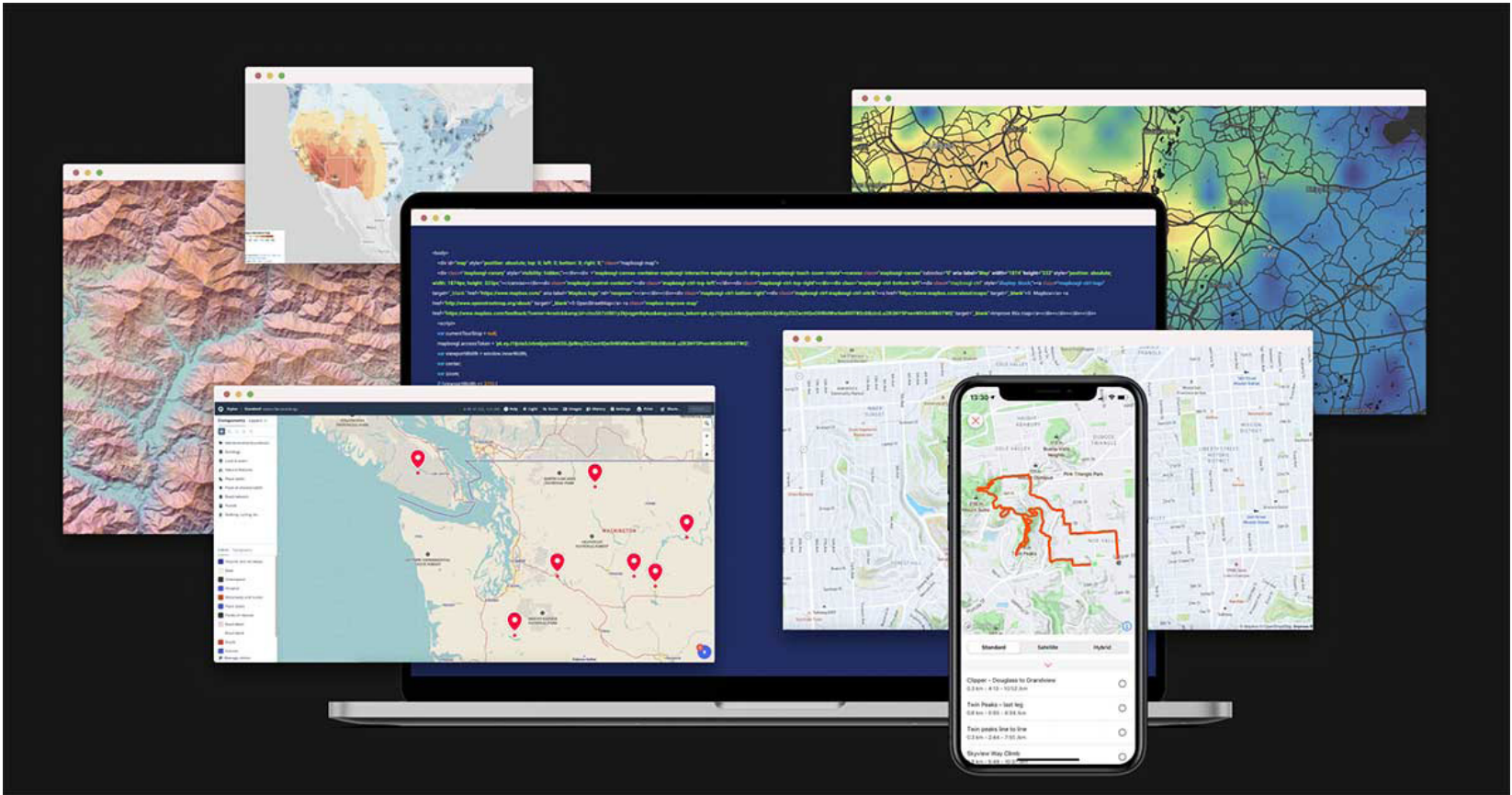
Leafleat Library
CartoCSS
TileMill cartography IDE

MBTiles specification
Mapbox Style Specification
Mapbox GL JS
Mapbox GL Native
Mapbox Tiling Service
Mapbox Studio

Projection

Spherical Mercator projection

|				
☐ Kharchenko-Shabanova	☐ Lagrange	☐ Lagrange (120°)	☐ Lambert Cylindrical	☑ Lambert CC
☐ Lambert Equal-Area Conic	☐ Larrivée	☐ Laskowski Tri-Optimal	☐ McBryde P3	☐ McBryde Q3
☐ McBryde S2	☐ McBryde S3	☑ McBryde S3 (i.)	☐ McBryde-Thomas #1	☐ McBryde-Thomas #2
☐ McBryde-Thomas FPP	☐ McBryde-Thomas FPQ	☐ McBryde-Thomas FPS	☐ McBryde-Th. FPQ (i.)	☐ Mercator

Zoom Levels & Tile Grid
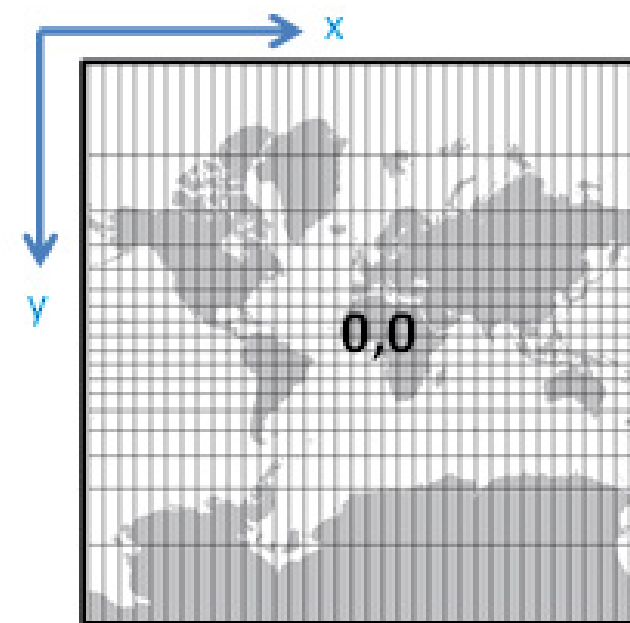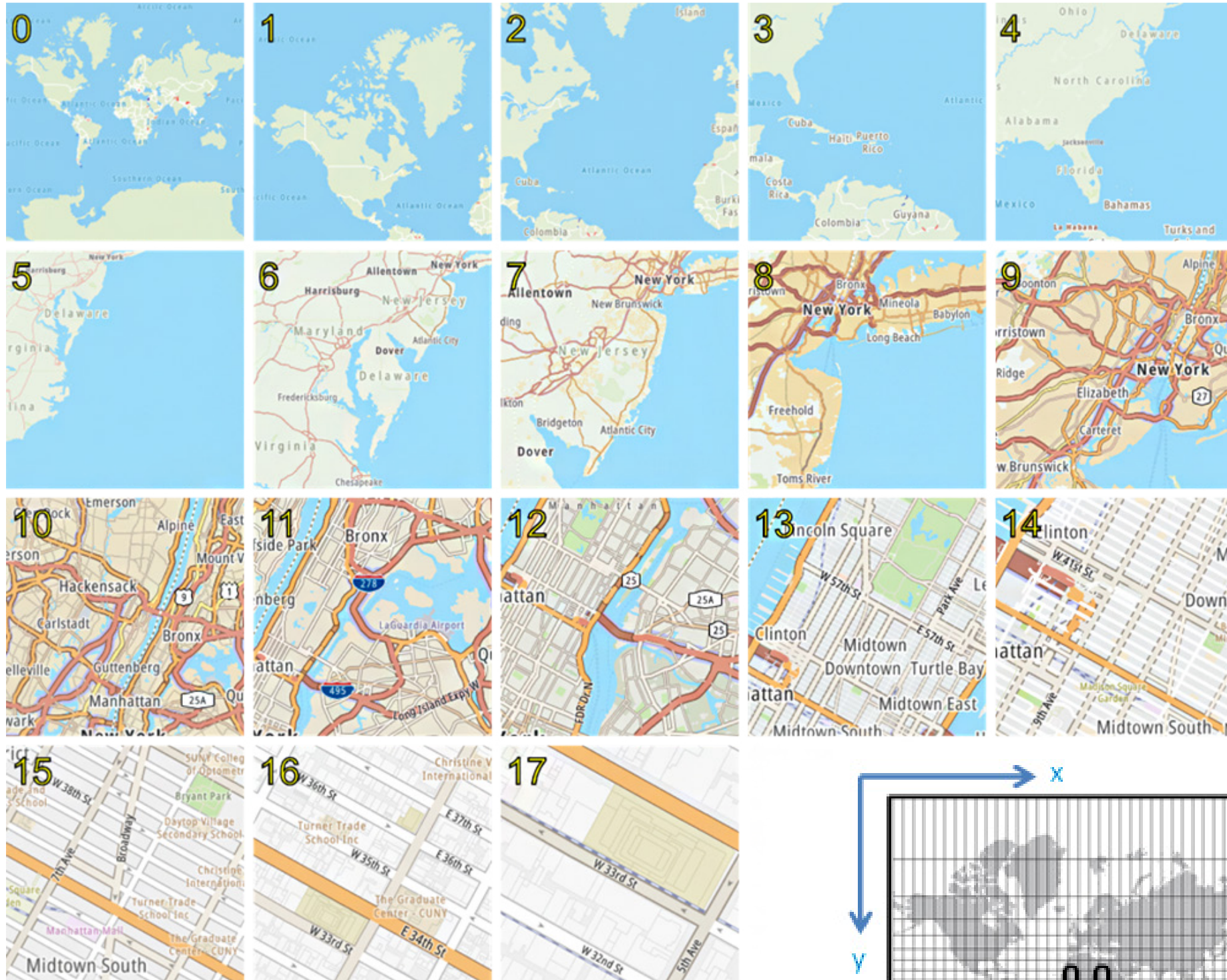
Zoom Level: 0
Number of Tiles: 1
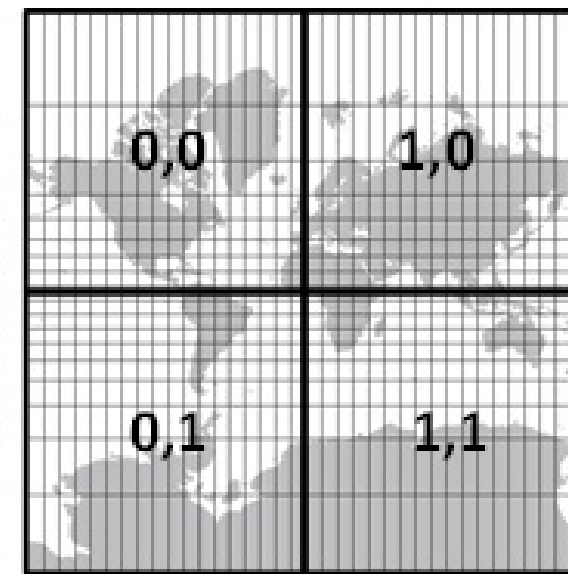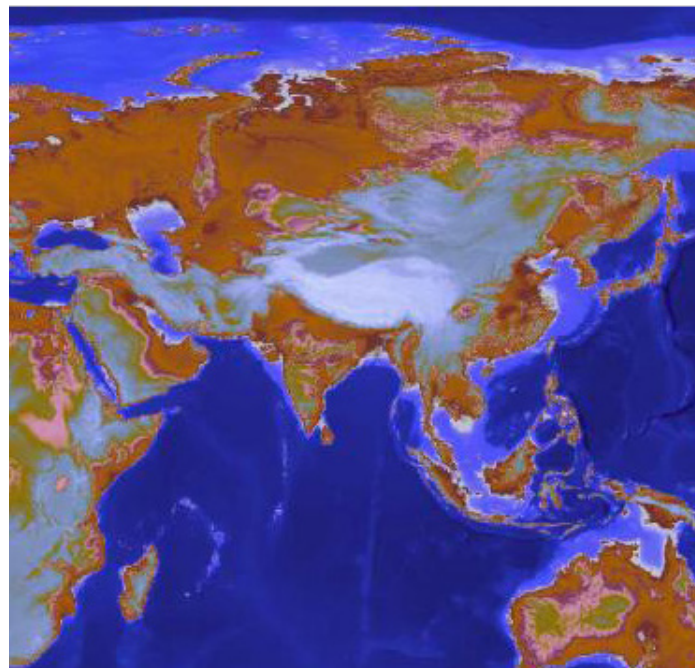
Zoom Level: 1
Number of Tiles: 4
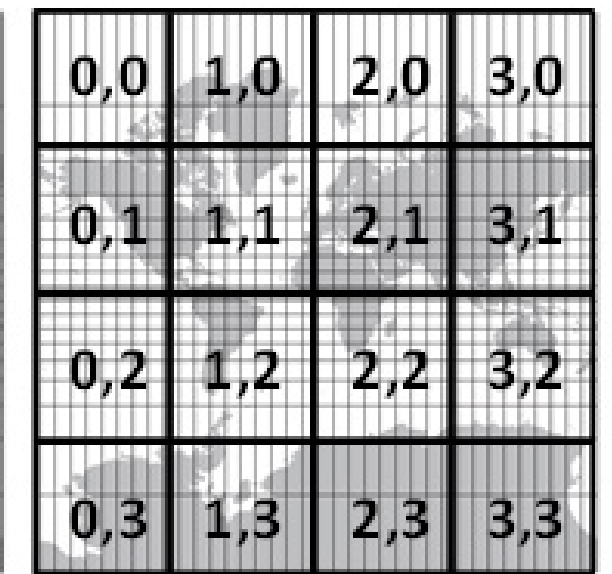
Zoom Level: 2
Number of Tiles: 16

Tile

Rester Tile

단일 이미지
HillShade(DEM), 위성사진

Vector Tile

스타일링, GL 렌더링 가능
Google Protocol Buffers

…/ZoomLevel/X/Y.mvt

Layer ·········

Feature ·········

(POLYGON,
LINESTRING, POINT)

Style

Vector Tile

water

landcover

transportation

building

point of interest
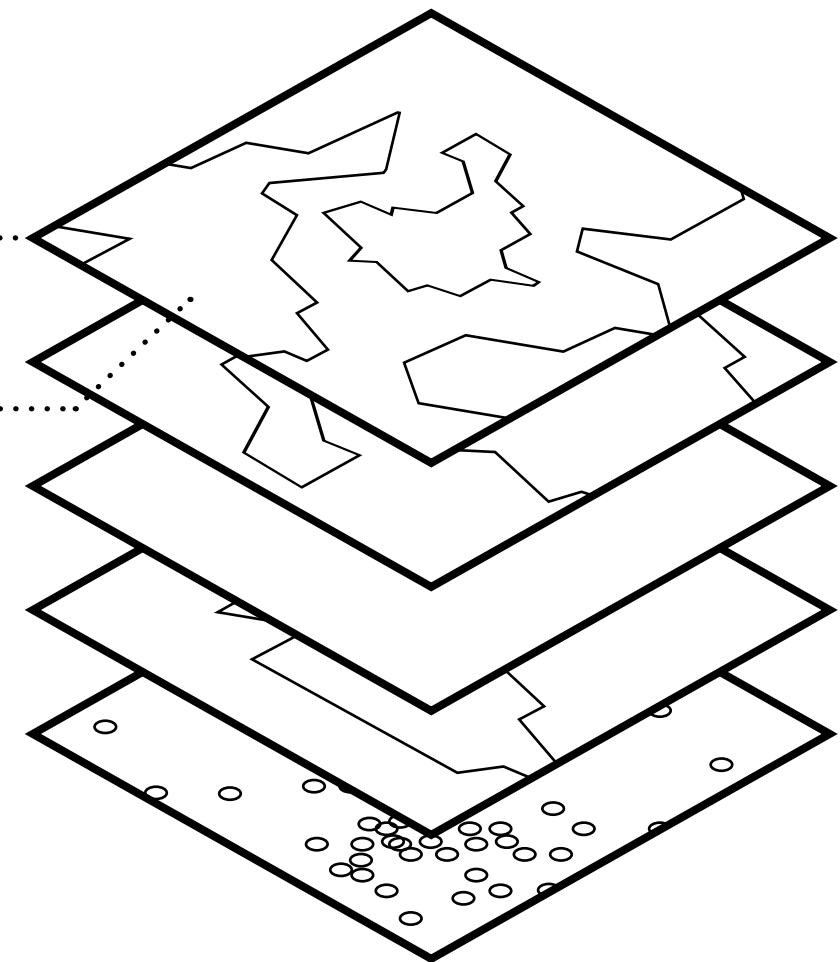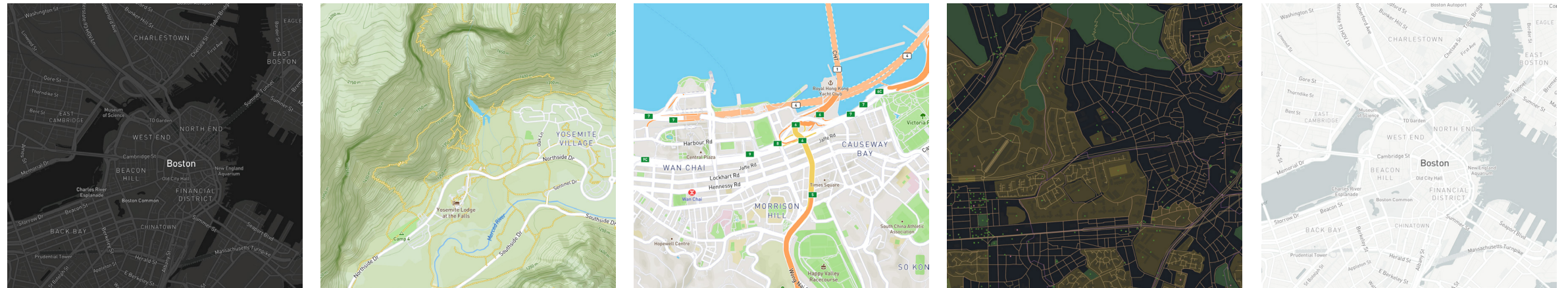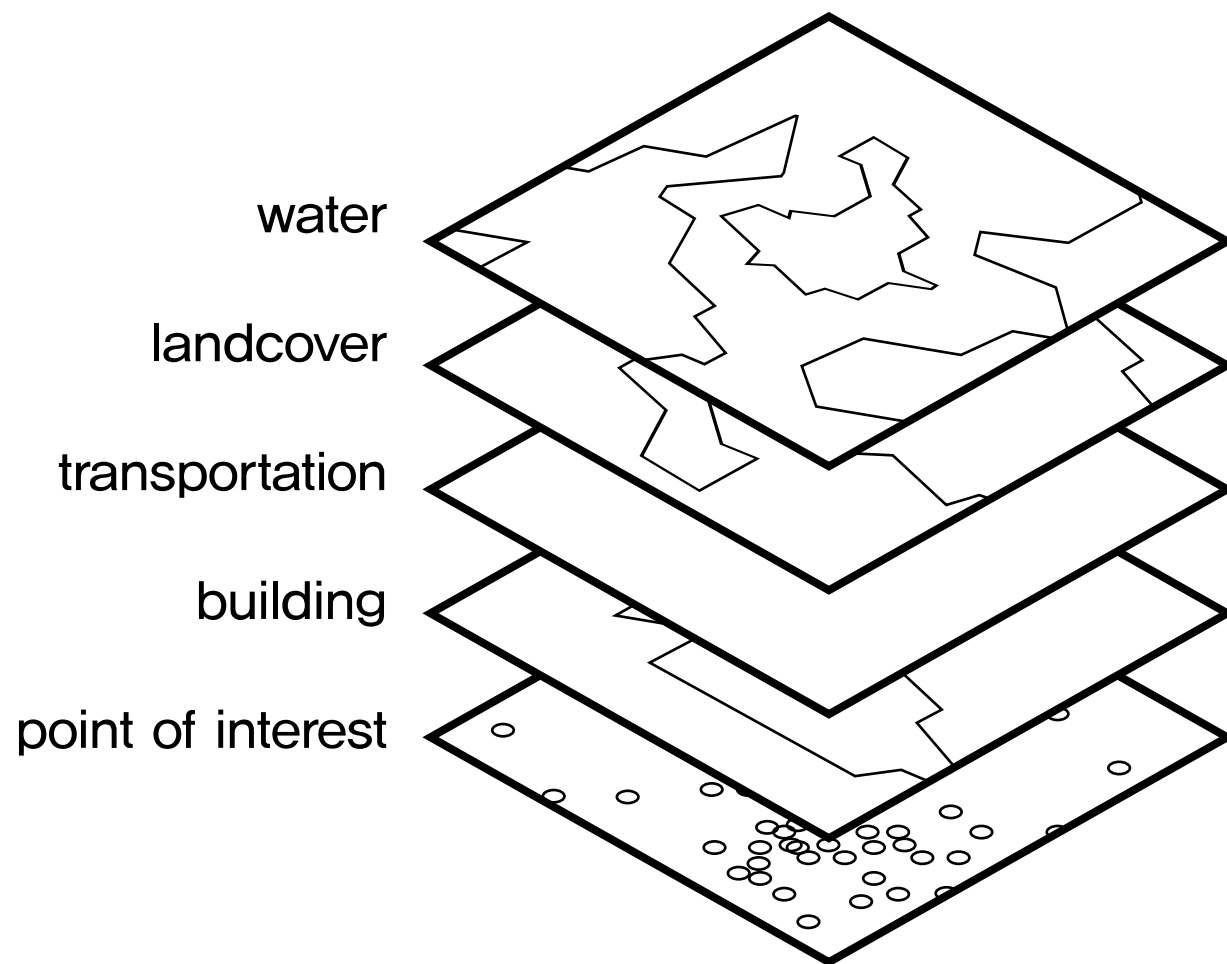
Style

style_specification.json

landcover_grass
    type: **fill**, filter: **class == grass**

landcover_industrial
    type: **fill**, filter: **class == indurtrial**

transportation_all
    type: **line**

poi_rank_1
    type: **symbol**, filter: **rank == 1**

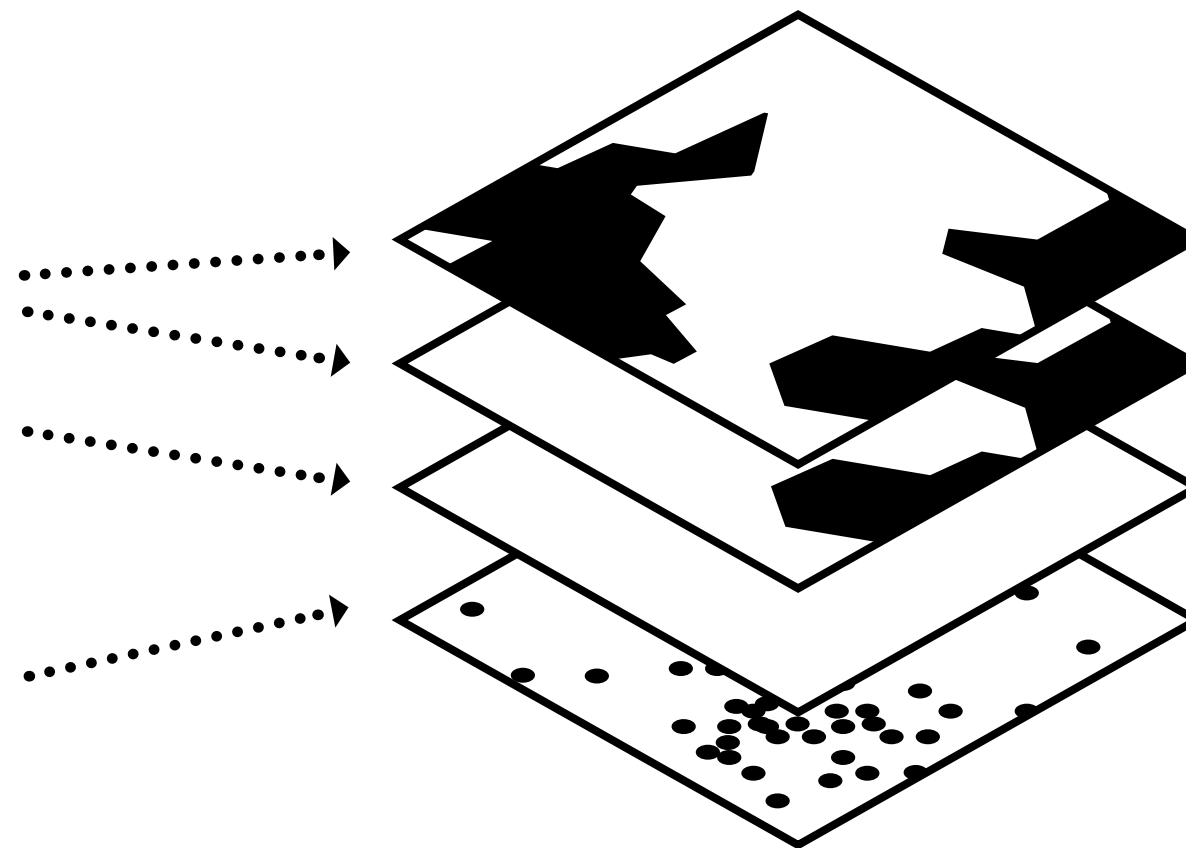**Style layers**

▲ landcover_grass   type: **fill**, filter: **class == grass**, fill-color: **#ff0000** ⋯

▲ landcover_industrial   type: **fill**, fill-color: **#2e2e2e**, fill-opacity: **0.3** ⋯

▲ transportation_all   type: **symbol**, text-field: **{name}**, text-size: **16** ⋯

+

⋮

Source

● water   geometry: { type: **Polygon**, coordinates: [**[102.0, 0.0]**, **[103.0, 1.0]**, **[104.0, 0.0]**, **[105.0, 1.0]** ⋯] } ⋯

● landcover   geometry: { type: **Polygon**, coordinates: [**[103.0, 1.0]**, **[104.0, 0.0]**, **[105.0, 1.0]** ⋯] } ⋯

+

● transportation   geometry: { type: **LineString**, coordinates: [**[104.0, 0.0]**, **[103.0, 1.0]**, **[104.0, 0.0]**, **[105.0, 1.0]** ⋯] ⋯

⋮

transform data   logitude, latitude, zoom level **...**

||

Parsed Tiles

zoom level, x, y

Tile (12, 3492, 1523)

buckets

▲●   type: fill, bufferArray: [0.1⋯]⋯

▲●   type: fill, bufferArray: [0.1⋯]⋯

▲●   type: symbol, bufferArray: [0⋯]⋯

Tile (12, 3492, 1524)

buckets

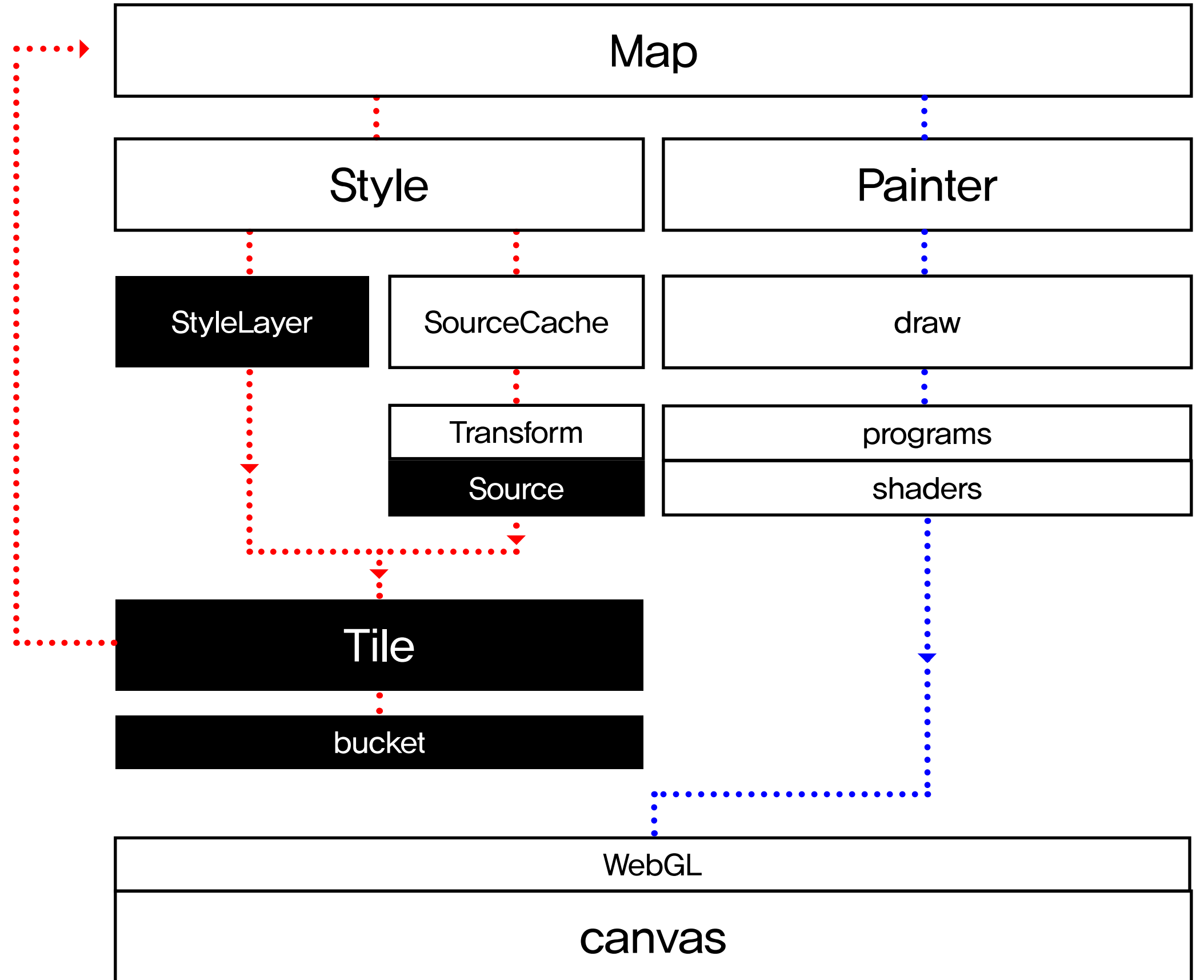▲●   type: fill, bufferArray: [0.1⋯]⋯

▲●   type: fill, bufferArray: [0.1⋯]⋯

▲●   type: symbol, bufferArray: [0⋯]⋯

Tile (12, 3493, 1524)

buckets

▲●   type: fill, bufferArray: [0.1⋯]⋯

▲●   type: fill, bufferArray: [0.1⋯]⋯

▲●   type: symbol, bufferArray: [0⋯]⋯

Flow

Map

Style	Painter

| StyleLayer | SourceCache | draw |

| Transform | programs |
| Source | shaders |

Tile

bucket

WebGL

canvas

① style/source 데이터 Tile로 변환

② Tile을 WebGL로 렌더링

* worker thread 작업

Reference

https://github.com/mapbox/mapbox-gl-js
https://docs.mapbox.com

Mapbox.gl source code analysis-basic architecture and data rendering process
https://www.cnblogs.com/dojo-lzz/p/10165817.html
Delft Students on Software Architecture: DESOSA 2017
https://delftswa.gitbooks.io/desosa-2017/content/mapbox-gl-js/chapter.html#external-vector-tiles
https://en.wikipedia.org/wiki/Map_projection
https://en.wikipedia.org/wiki/Mercator_projection