

Create / distribute tiled map

Taro Matsuzawa
Georepublic Japan

Notes (1/2)

- This presentation use some links to external resources
 - Please download the presentation from the link below

https://github.com/smellman/jica_2023

Notes (2/2)

- This presentation is written in Markdown
 - You can edit this presentation with any text editor
 - You can convert this presentation to PDF or PowerPoint, please see the README.md
 - You can download the presentation of auto generate versions from the link below
 - [PDF](#)
 - [PowerPoint](#)
 - [HTML](#)

Self introduction

- GIS Engineer at Georepublic Japan
 - Programming: Python, JavaScript, TypeScript, Ruby etc.
 - UNIX and Linux guru
 - GIS skill: Data processing, Tiled based Map
- Community
 - Director of [OSGeo.JP](#)
 - Director of [OpenStreetMap Foundation Japan](#)
 - Sub president of [Japan Unix Society](#)
 - [UNOpenGIS/7](#) volunteer
- Contact: taro@georepublic.co.jp / @smellman on Twitter

Today's agenda

- What is tiled map?
- Introduction of software and data in this presentation
- How to create your own tiled map
- How to design your own tiled map
- How to distribute your own tiled map

What is tiled map?

Tile technology

- Provide map image or data over the internet.
 - Map images are separated as tiles.
 - Zoom Level 0 = World
 - Each zoom level doubles in the dimensions.
 - Too many tiles use "Web Mercator" projection.

<https://a.tile.openstreetmap.org/0/0/0.png>

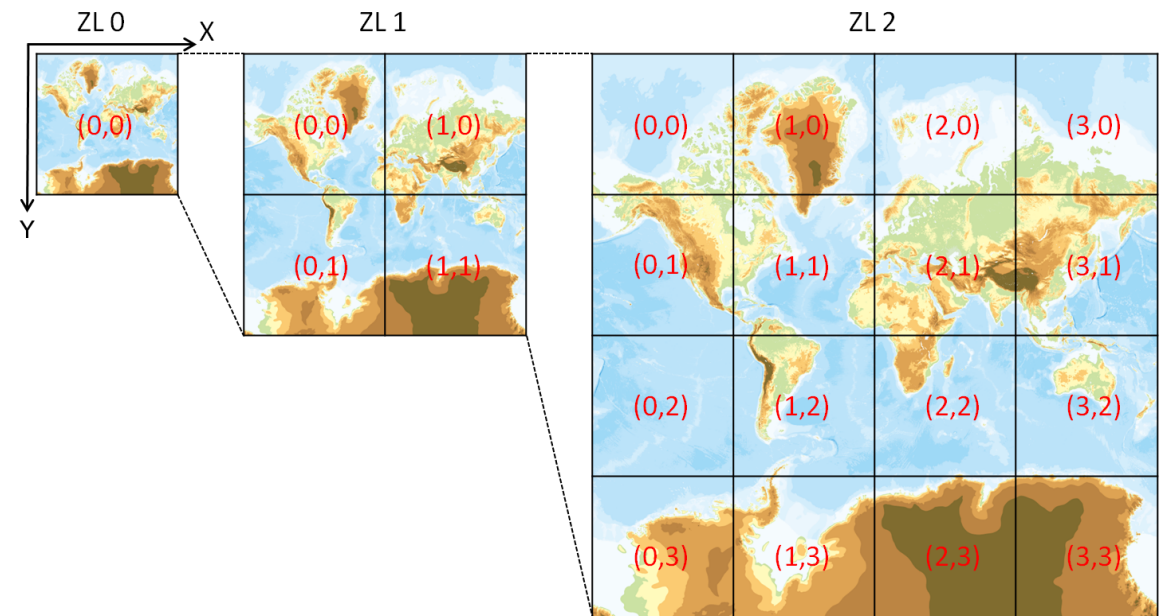


Useful to web

- Structure of tile is useful for web.
 - Enable to scroll map smoothly.
 - Enable to zoom up and zoom down map smoothly.
 - HTTP GET request.
- Tile become known for Google Maps.
 - Tile has existed from the late 1990s.

Zoom

- Zoom level 0 : 1 file
- Zoom level 1 : $2 \times 2 = 4$ files
- Zoom level 2 : $4 \times 4 = 16$ files
- ...
- Zoom level 18 : $2^{18} \times 2^{18} = 262,144 \times 262,144 = 68,719,476,736$ files



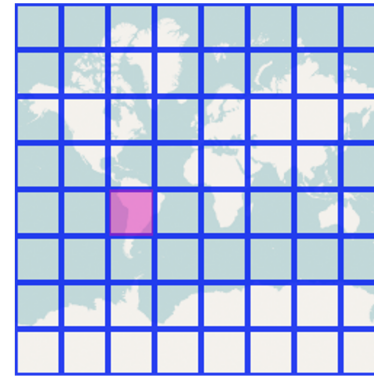
<https://maps.gsi.go.jp/help/image/tileNum.png>

GET Request

- Many services use REST API(GET Request).
 - `https://.../Z/X/Y.Format`
 - Z: Zoom Level
 - X: X coordinate
 - Y: Y coordinate
 - Format:
 - Raster image format(png, jpg, webp)
 - Vector data format(pbf, mvt)

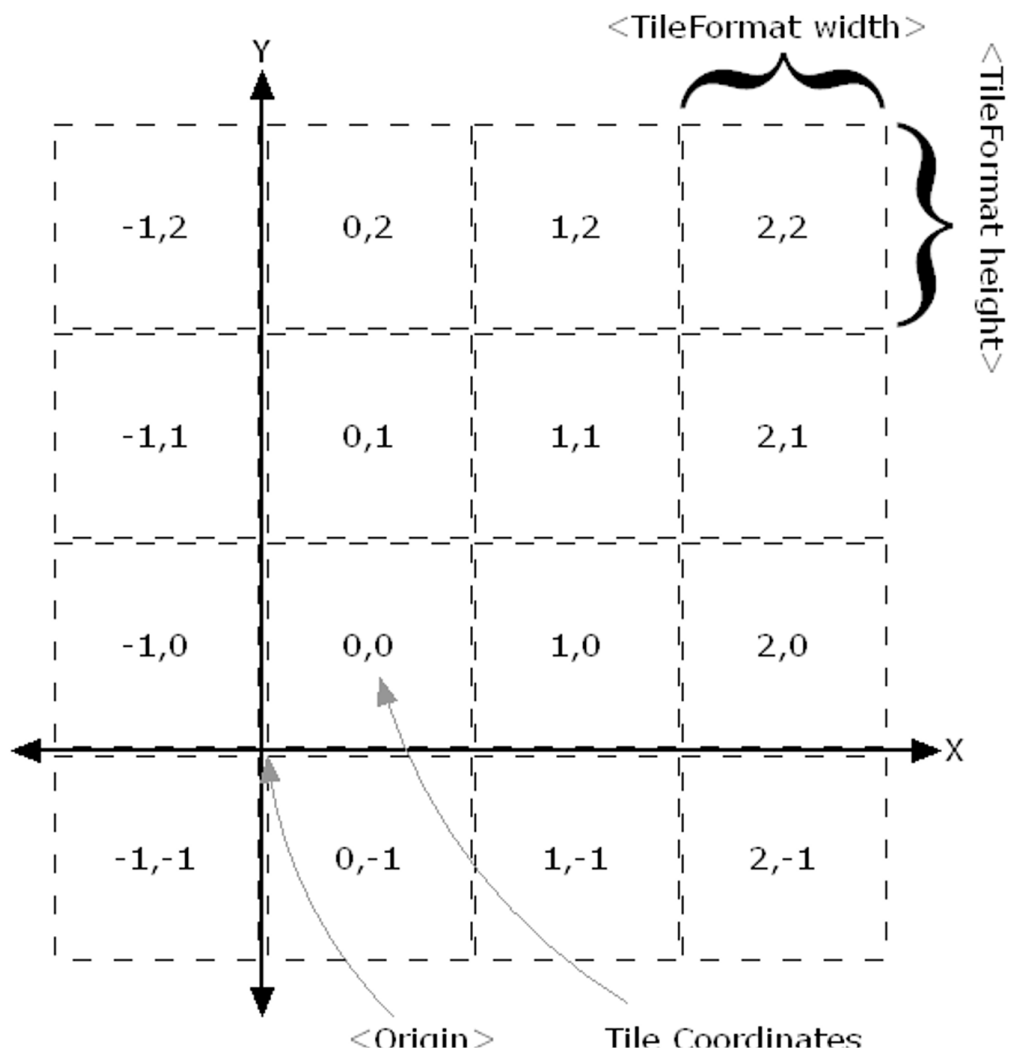
GET Request example

- <https://a.tile.openstreetmap.org/3/2/4.png>
 - Zoom = 3, X = 2, Y = 4, format = png
 - X and Y coordinates start with 0.

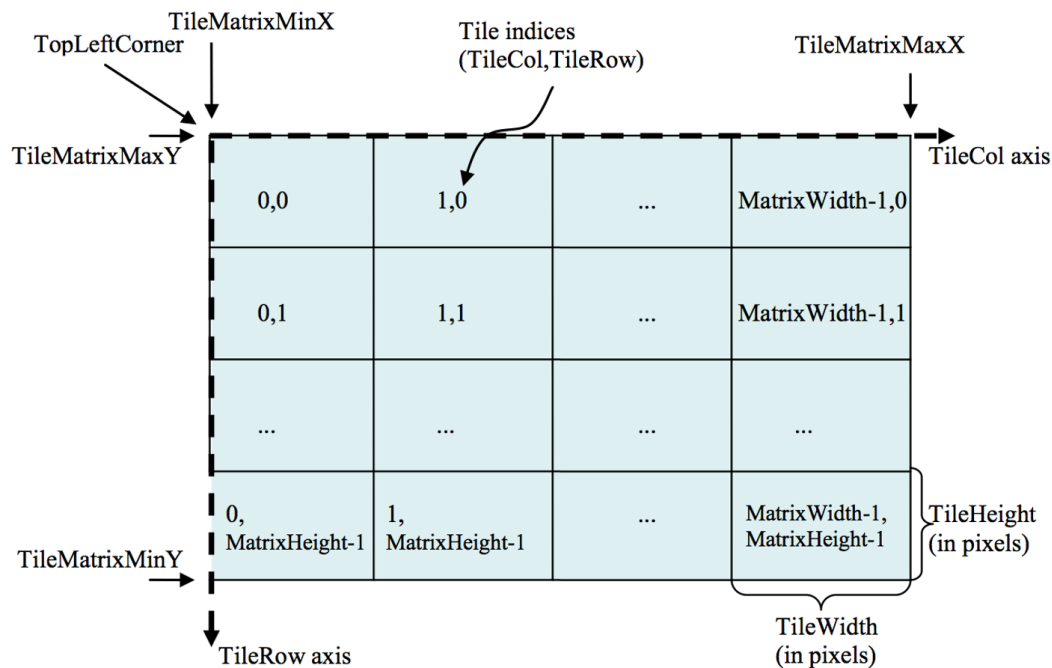


Specification

- Two tile service specifications are popular.
 - Tile Map Service(TMS)
 - Web Map Tile Service(WMTS)
- TMS is simpler than WMTS.
- TMS's X Y coordinate is started from bottom left.
 - Same as Cartesian coordinate system.
- WMTS's X Y coordinate is started from top left.
 - Same as Coordinate system of 2D computer graphics.



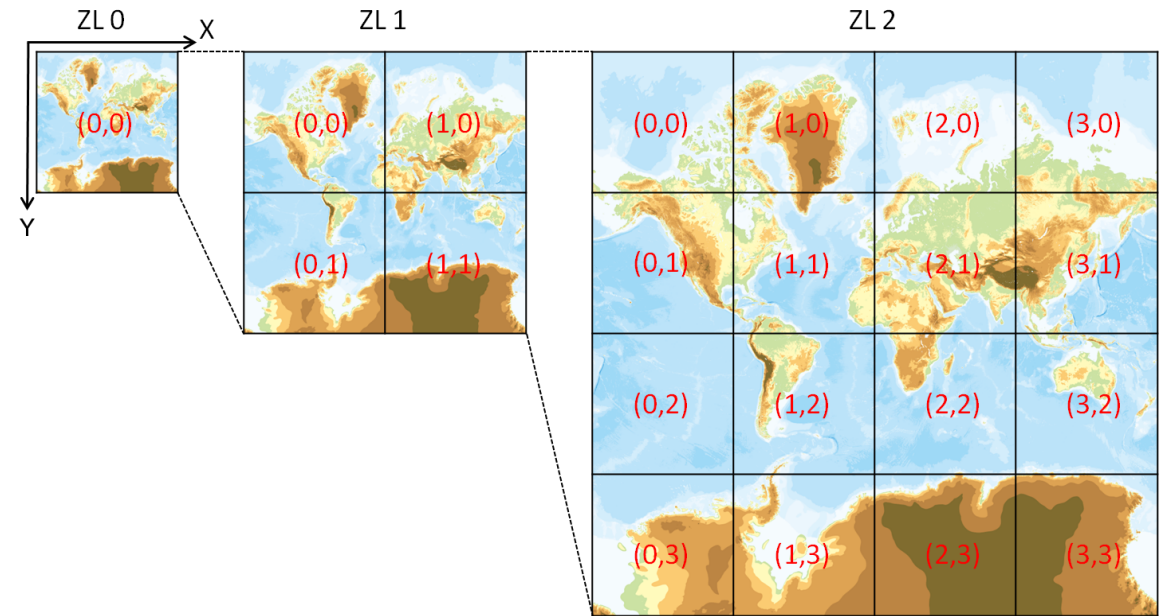
TMS



WMTS

The Y coordinate flipped

- OpenStreetMap use TMS like protocol but Y coordinate is numbered from top.
 - OpenStreetMap call "Slippy Map".
 - We call xyz tile.
 - $\{z\}/\{x\}/\{y\}.png$
 - Also we call zxy tile.



<https://maps.gsi.go.jp/help/image/tile>

Num.png

