Create / distrubute 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 presentationå

- 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
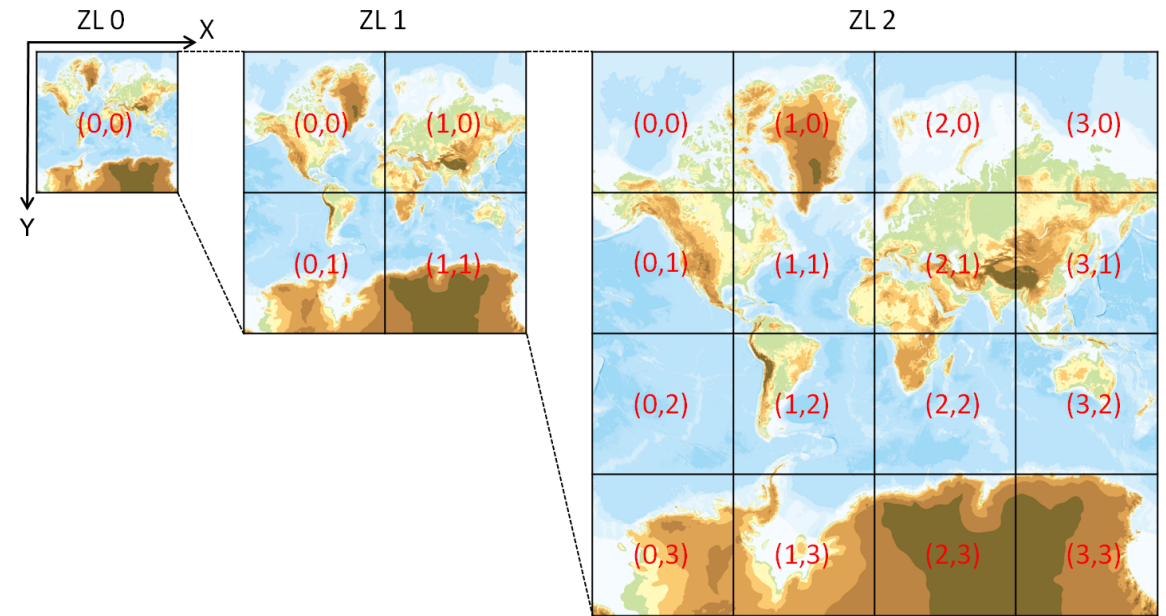
Useful to web

- 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 x 2 = 4 files

- Zoom level 2 : 4 x 4 = 16 files

- ...

- Zoom level 18 : 2^{18} x 2^{18} = 262,144 x 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

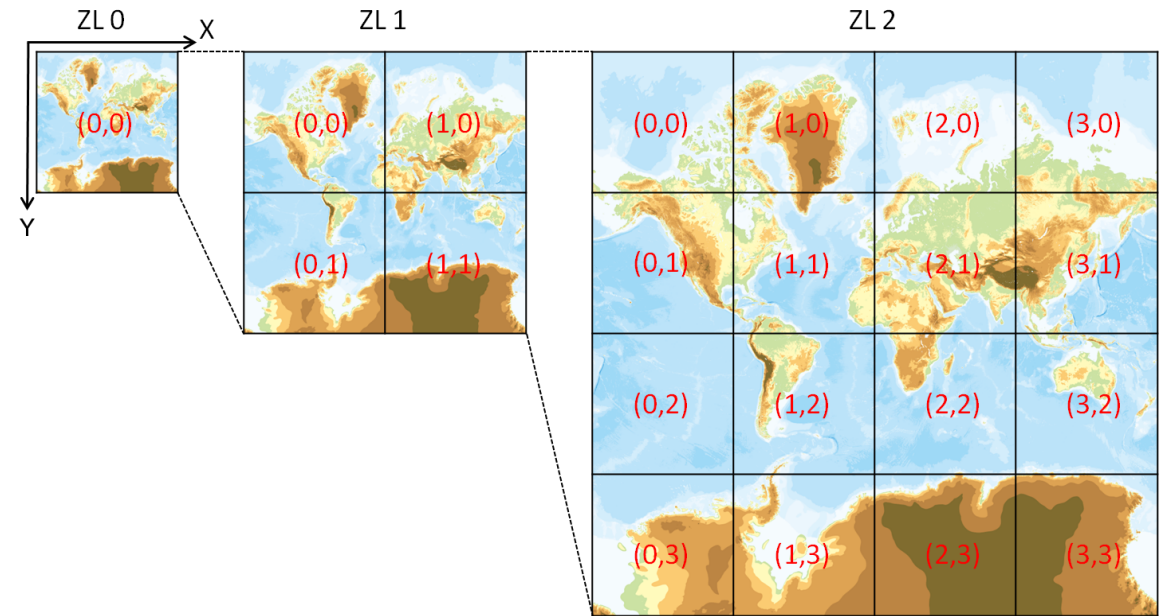- https://a.tile.openstreetmap.org/3/2/4.png
  - Zoom = 3, X = 2, Y = 4, format = png
  - X and Y coordinates start with 0.

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.

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/tileNum.png