UN Open GIS INITIATIVE

UN Vector Tile Toolkit development and its application

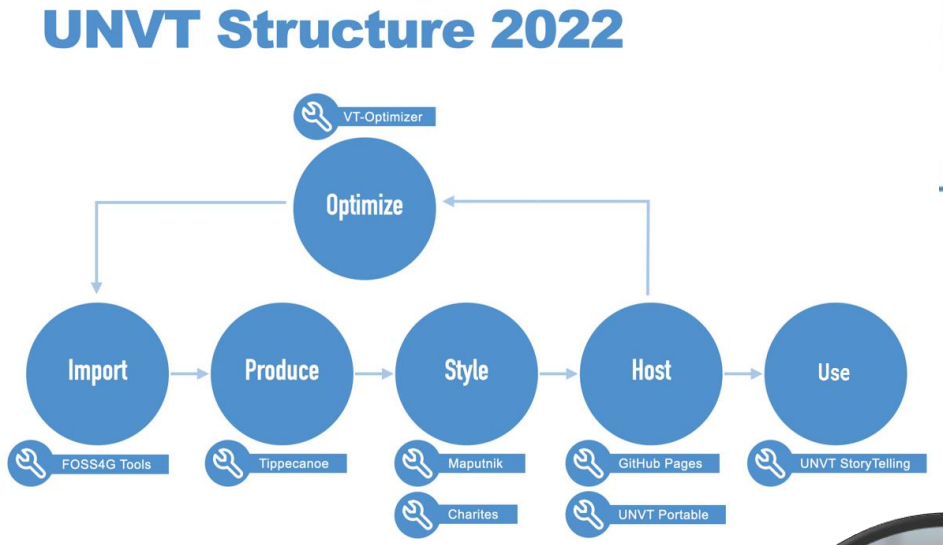
Taro Ubukawa, Hidenori Fujimura, Diego Gonzalez Ferreiro, Paolo Frizzera, Oliva Martin Sanchez, Takayuki Miyauchi, Shinichi Nishikawa, Naoki Ohashi, Jin Igarashi, Taichi Furuhashi

The United Nations Vector Tile Toolkit

United Nations Geospatial

UN Vector Tile Toolkit

Combining efforts with UN.



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- UNVT is a collection of Open Source Software (OSS) to produce, host, style, optimize and use vector tiles for web mapping. It also shares technical know-how.
- UNVT is an effort under **the UN Open GIS Initiatives**. It was initiated by Mr. Hidenori Fujimura in 2018
- UNVT first aims to achieve automatic continuous update of the basemap vector tiles for UN operations. It also aims to facilitate the use of the vector tile technology among partners.

Meet him in Florence!
Founder of UNVT.
Mr. Fujimura

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Some example of our tool

Our tools and activities cover various phases of vector tile development/application.

Tools listed here are some example of newly developed UNVT for general use.

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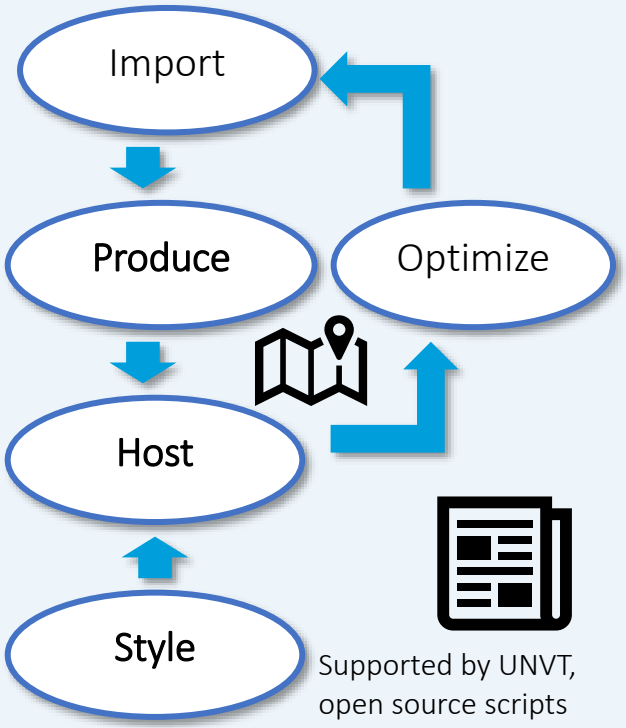
UNVT workflow of developing **vector tile** for base map



The United Nations Vector Tile Toolkit

New developments in UNVT

- produce - 3D
- host - FTS
- style - charites
- optimize
- use - storytelling

Vector Tile Styling tool – unvt/charites
- make styling work easy and fun

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Efficient Styling– Use of YAML files

- **JSON file** based on Mapbox style specification (or MapLibre style specification)
- Wise use of YAML files increases efficiency
- We use UNVT/charites

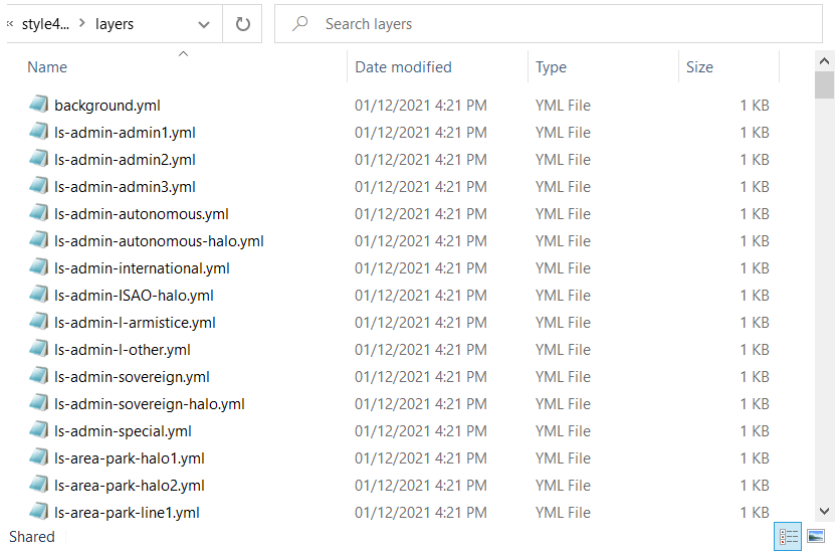
Style files (mapbox/maplibre/arcgis)

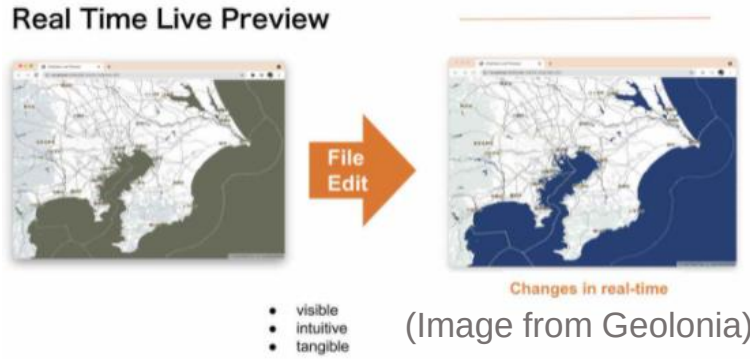
- **JSON format**
  - Many lines (thousands)
  - In a single file
  - Hard to read/edit

Our tool **Charites**

Let's edit with

- **YAML format**
  - Human readable
  - Structured files
  - Re-usable
  - Stored in the series of config files





(Image from Geolonia)

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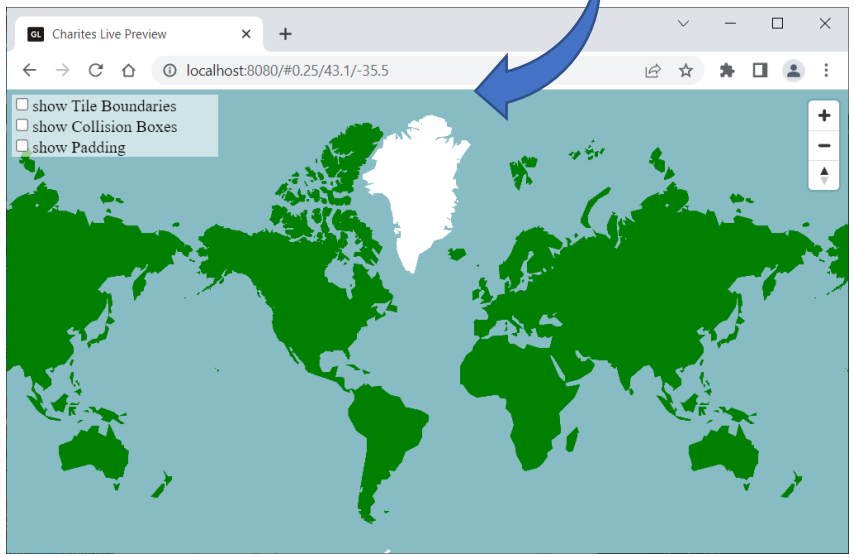
Unvt/charites

land(ice).yml

```yaml
id: land(ice)
type: fill
source: esri
source-layer: Land
filter:
  - '=='
  - _symbol
  - 1 #1 is ice 0 is non ice (See Green Land)
maxzoom: 15
paint:
  fill-color: white #rgb(174, 255, 147)
```

You can easily design layers with text files (yaml).



The United Nations Vector Tile Toolkit

https://qiita.com/T-ubu/items/33cb4617a4db468eb208

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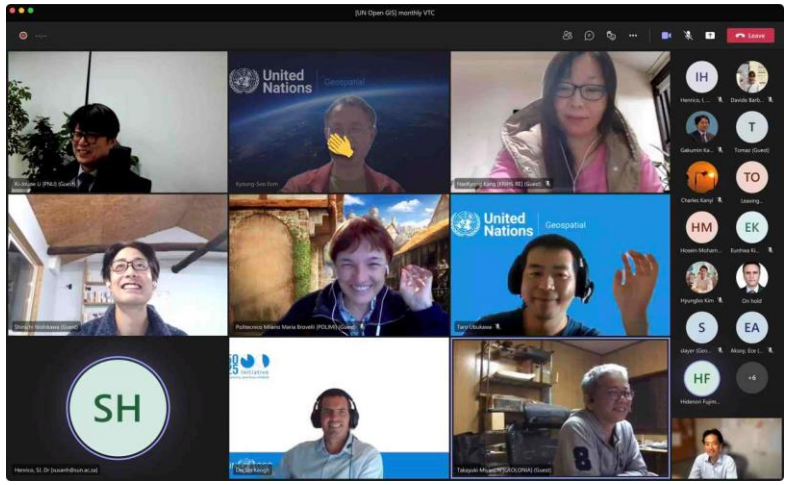
A story about the tool development:

- Originally, we used HOCON parser to edit the style. These work was reported at UNVT workshop in May 2021
- Our partner, **Geolonia**, supported the shared idea, and contributed to develop a tool with YAML files. They contributed their tool at the UN Open GIS monthly meeting in October 2021.



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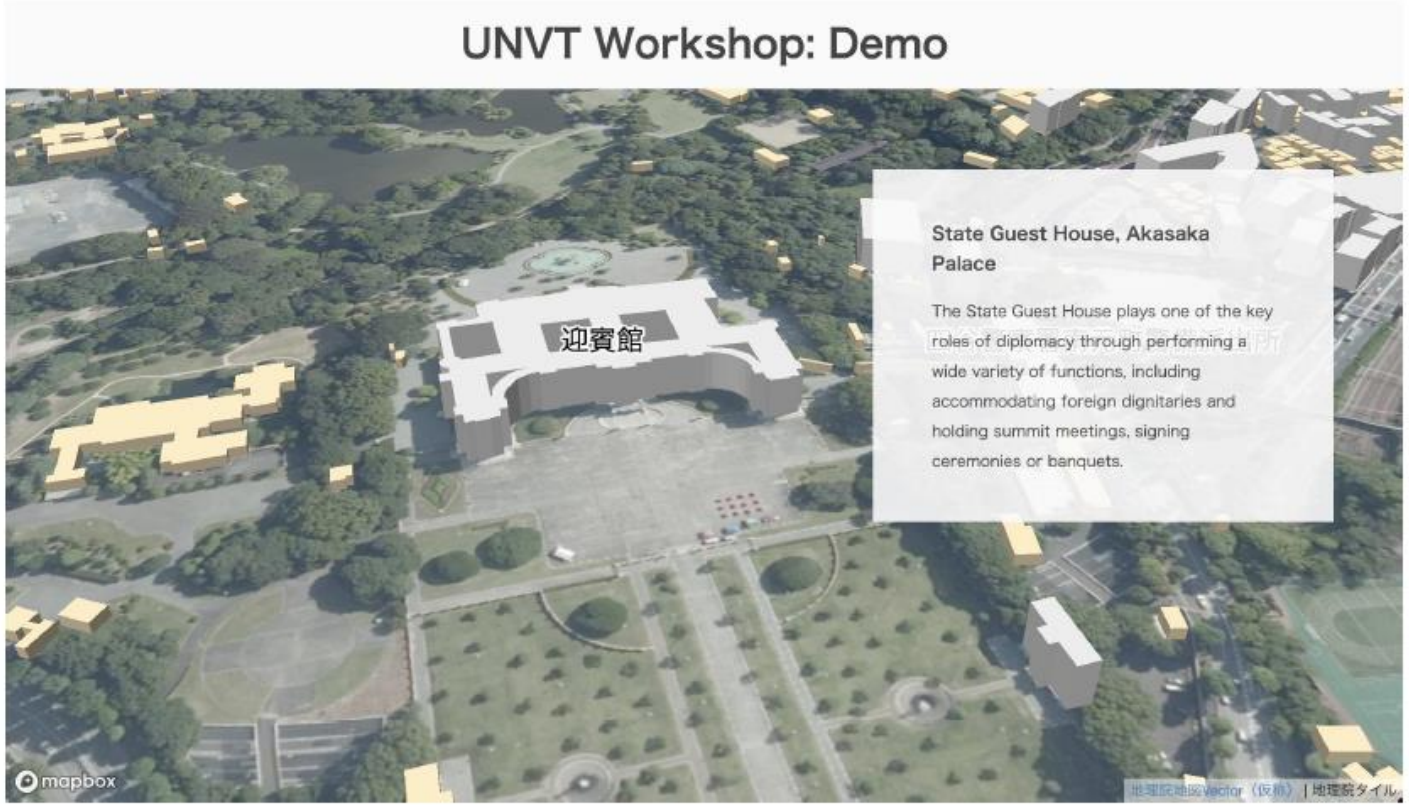
Storytelling – unvt/tell

A tool for data consumption.
Making a simple story-telling map with easy preparation. (Just prepare text with YAML fortmat.)

- https://github.com/unvt/tell
- https://www.youtube.com/watch?v=CVajhAUDLMs



Workshop was recorded and released from YouTube

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Storytelling:

Making a story map
by editing simple text (YAML)

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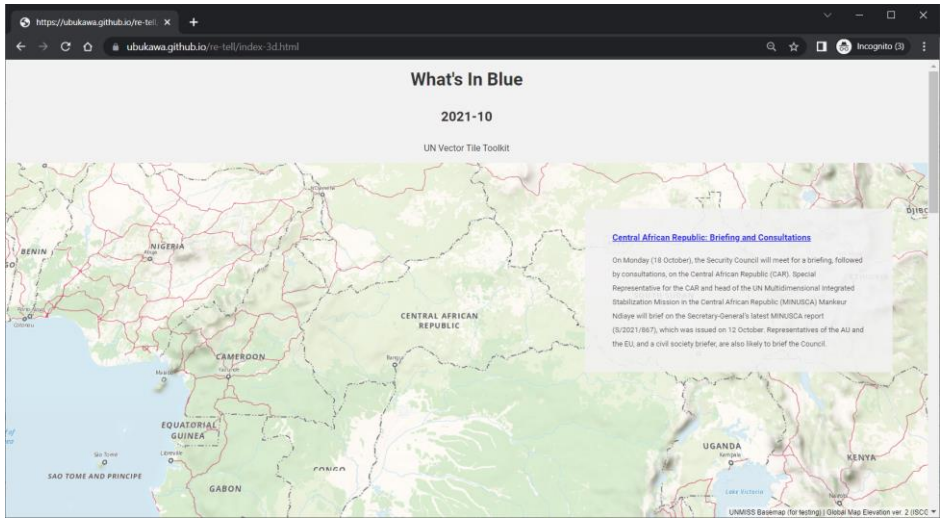
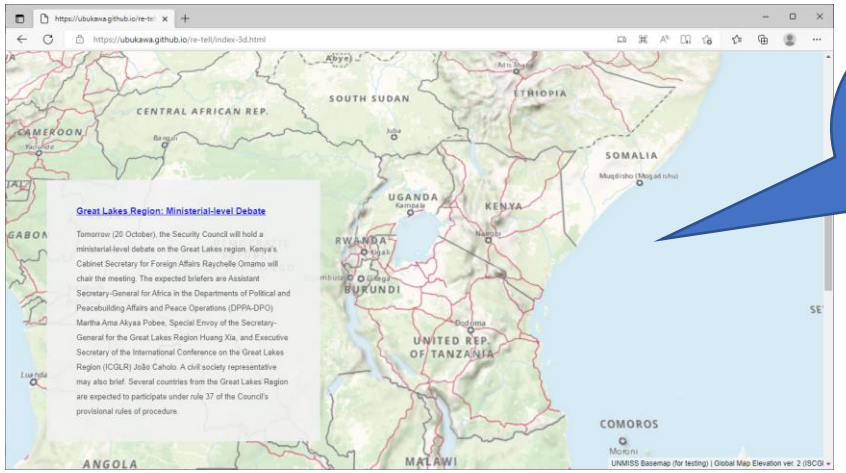
story.yml - Notepad

File Edit Format View Help

```
style: ./style.json
title: What's In Blue
subtitle: 2021-10
byline: UN Vector Tile Toolkit
theme: light
footer: This is the end of the story. The source of this story is <a href='https
view:
# you can pick the location information from https://optgeo.github.io/relief
  car:
    center: [21.91, 7.71]
    zoom: 4.84
  lakes:
    center: [33.9, -3.15]
    zoom: 4.84
  haiti:
    center: [-73.73, 19.25]
    zoom: 5.34
chapters:
  - id: c1
    alignment: right
    url: https://www.securitycouncilreport.org/whatsinblue/2021/10/central-afri
    title: Central African Republic: Briefing and Consultations
    description: >
      On Monday (18 October), the Security Council will meet for a briefing, fo
    location: car
  - id: c2
    alignment: left
    url: https://www.securitycouncilreport.org/whatsinblue/2021/10/great-lakes-
```

Ln 3, Col 18 130% Unix (LF) UTF-8





Map moves with the story

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3D expression (1) – Use of 3D Terrain

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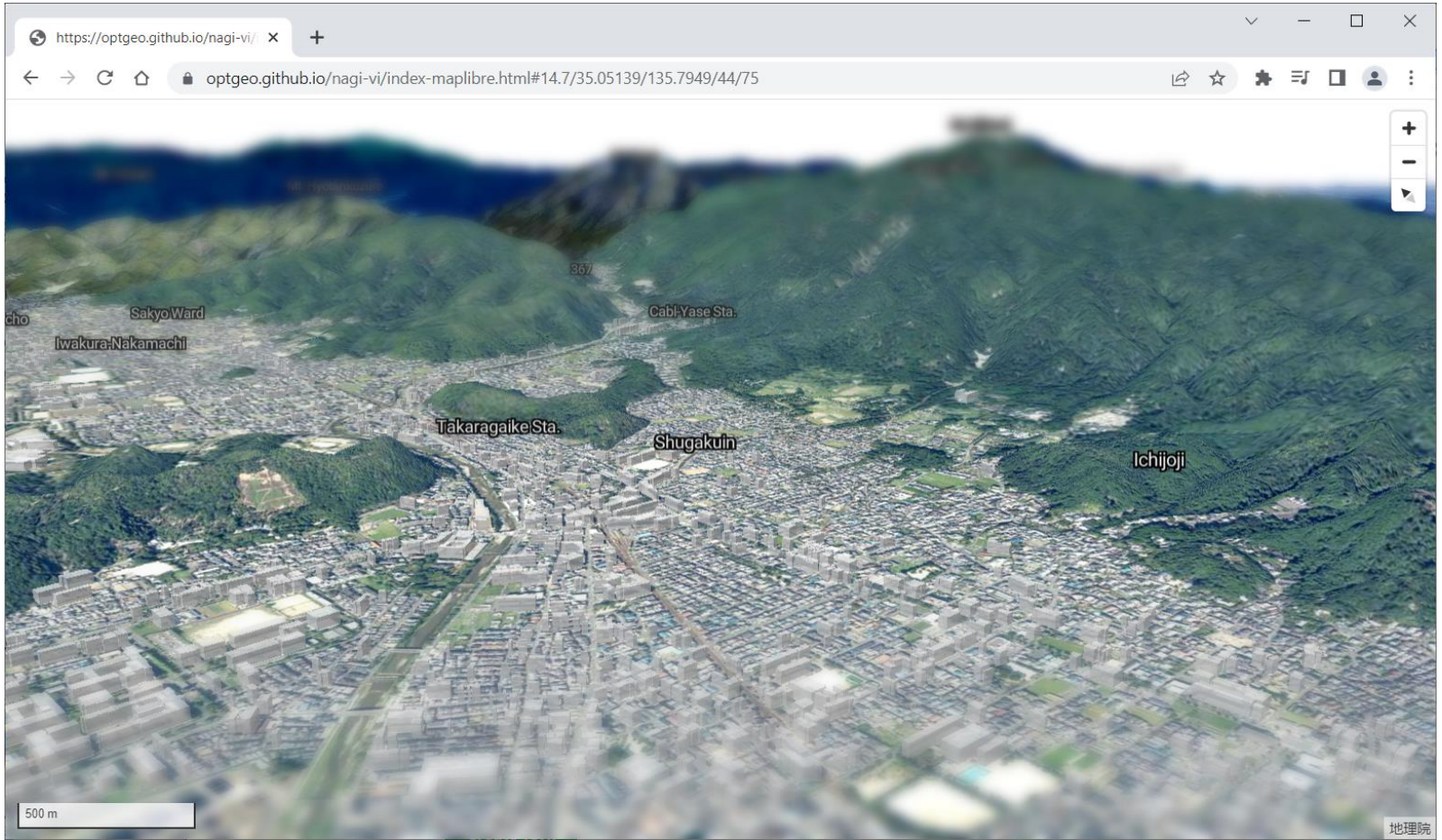
- 3D terrain with **Mapbox GL JS and MapLibre GL JS**: https://github.com/optgeo/nagi-vi
- Vector Tiles + Terrain Tiles + Orthophotos (focus on center)



We were one of the early users of MapLibre GL JS ver. 2.2.x (3D terrain.)

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3D expression (2) – voxel tile

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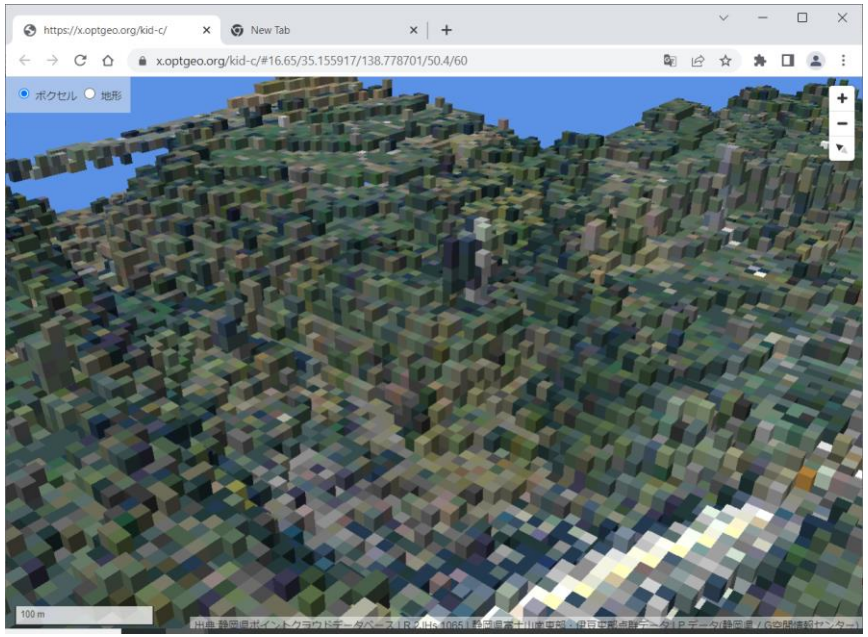
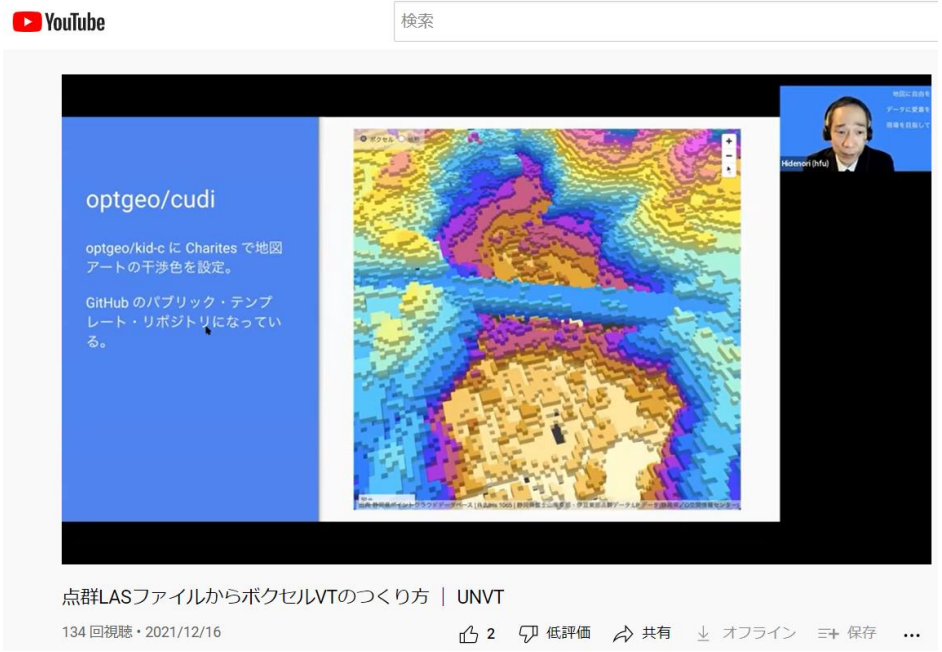
- A lot of work on voxel tiles:
  - Lightweight abstraction of lidar data





https://github.com/optgep/kid-c
https://github.com/optgeo/togari
Etc…

Learning Material:
Creation of Voxel vector tile from LAS (in Japanese)
© FuruhashiLab., hfu and UNVT contributors, CC0
https://www.youtube.com/watch?v=LrDk0VFodTE

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3D expression (3) – RGB Elevation

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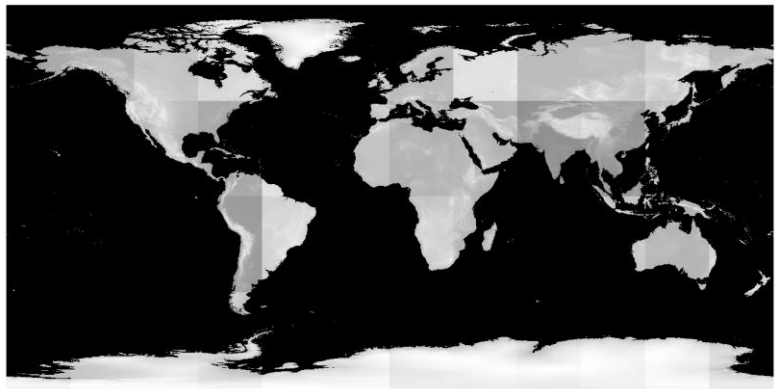
Let's develop Free and Open RGB Elevation tiles from the open source DEM

- We have a tool to easily create RGB elevation tile
  - https://github.com/unvt/rgbify -- A docker file based on osgeo/gdal:ubuntu. It has mapbox/rio-rgbify in it.
- Development of RGB elevation tiles from SRTM data and others.
  - from SRTM: ZL 6-12 https://github.com/unvt/rgbify-srtm (About 180GB)
  - from Global Map: ZL 2-8 https://github.com/ubukawa/globalmap-el (About 2 GB)

SRTM has some void area. Need for further improvement.



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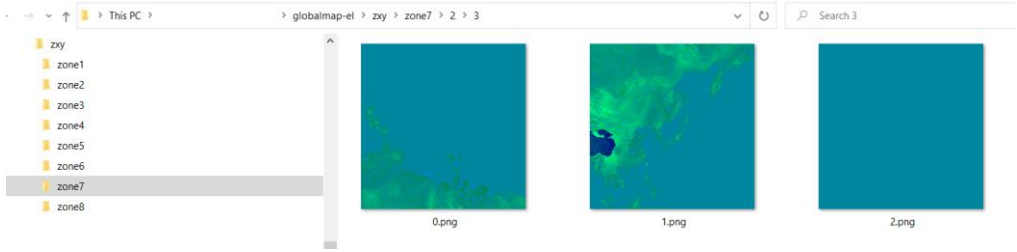

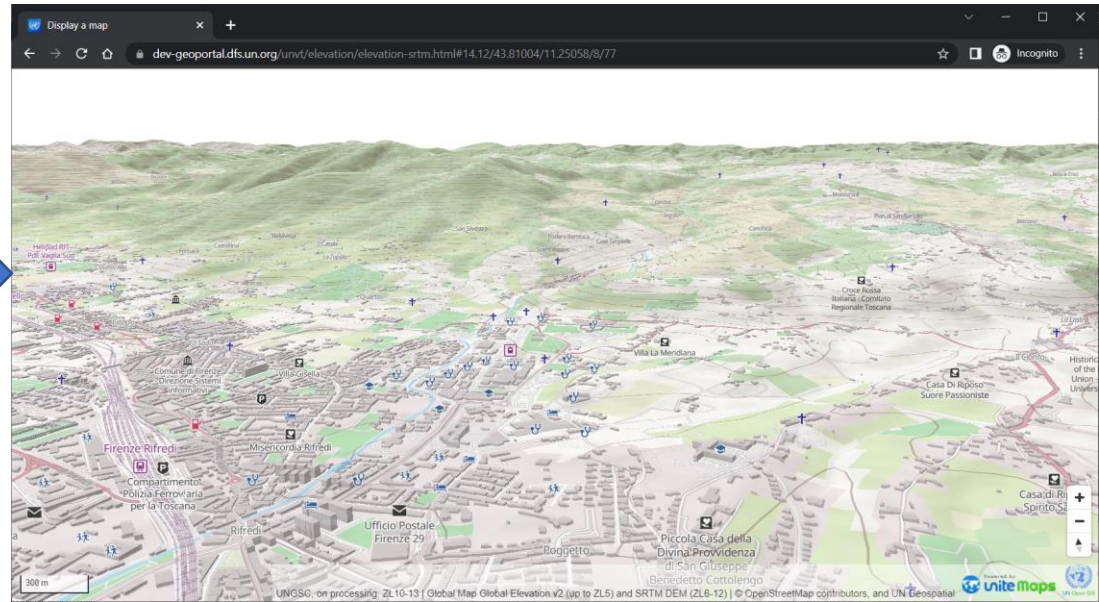

Vector Tile on Raspberry Pi

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- We can build **a vector tile server** and/or **a data processing machine** with a single board PC.
- It is also good for education.

How can we build a vector tile processing machine?

We have developed a single line Tool installer for Raspberry Pi. By running it, we can create a ready-to-use vector tile processor!

https://github.com/unvt/equinox

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Some ongoing projects

- Projects Powered by UNVT

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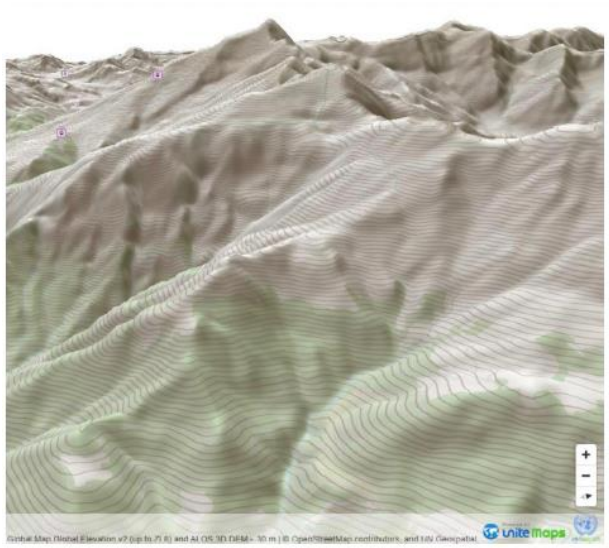
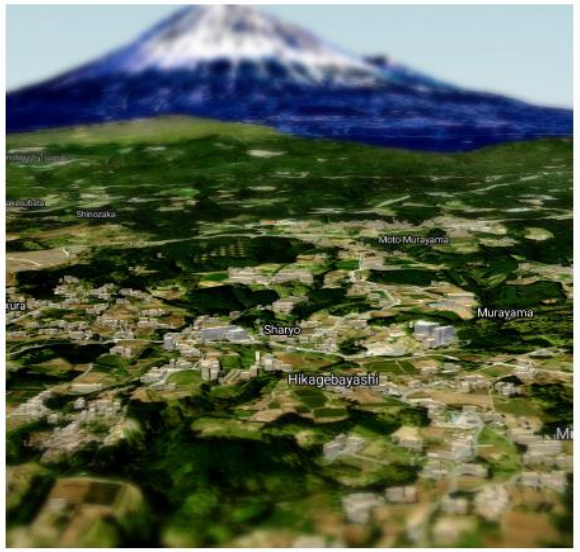
UNVT supports various web map operations by partners.

UNGSC
United Nations Global Service Centre



GSI
Geo. Info. Authority of Japan



ASIG
State Authority for Geo. Info.

Figures from Fujimura (2022)

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Vector Tile Development in UN

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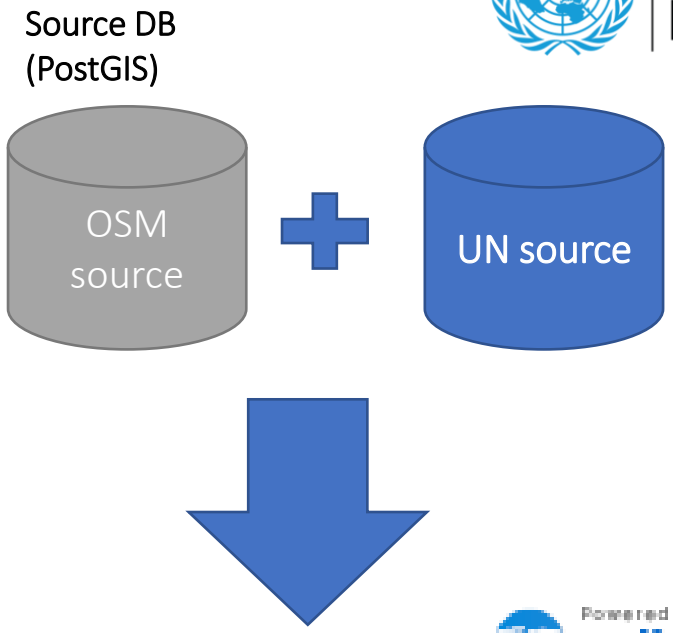
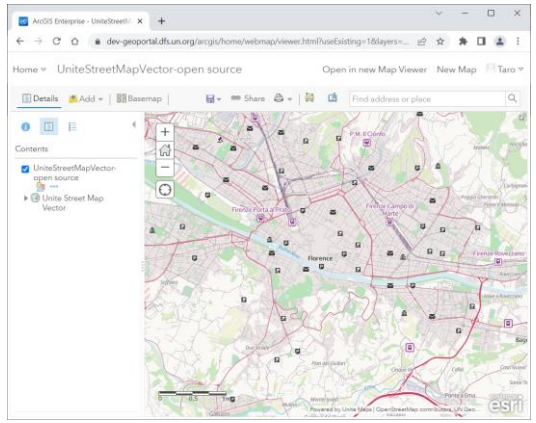
UN Mappers

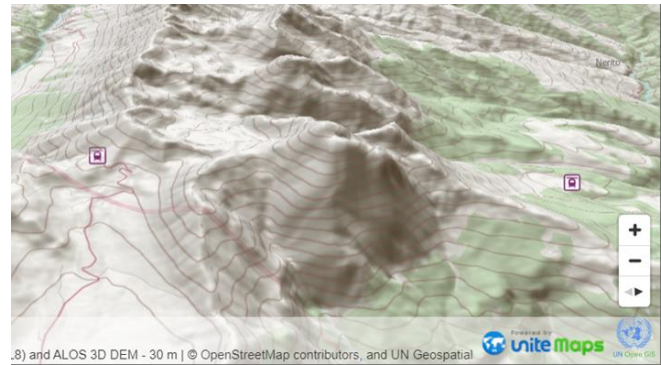
- Vector tile from PostGIS database
  - Use of nodejs scripts and tippecanoe
  - 841 mbitles, up to ZL15 (**162 GB**)
- Automatic update
  - Daily or weekly update as scheduled task.
  - (**35 hours** for global data update if needed.)
- Style is prepared
  - Both 2D and 3D
- Hosting web map
  - Vector Tiles for Esri Arcgis Online.
  - Web Map APP with MapLibre



Users
- Web APP
- GeoPortal
- Etc.

Powered by unite Maps





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UN experience: Vector Tile in ArcGIS Online

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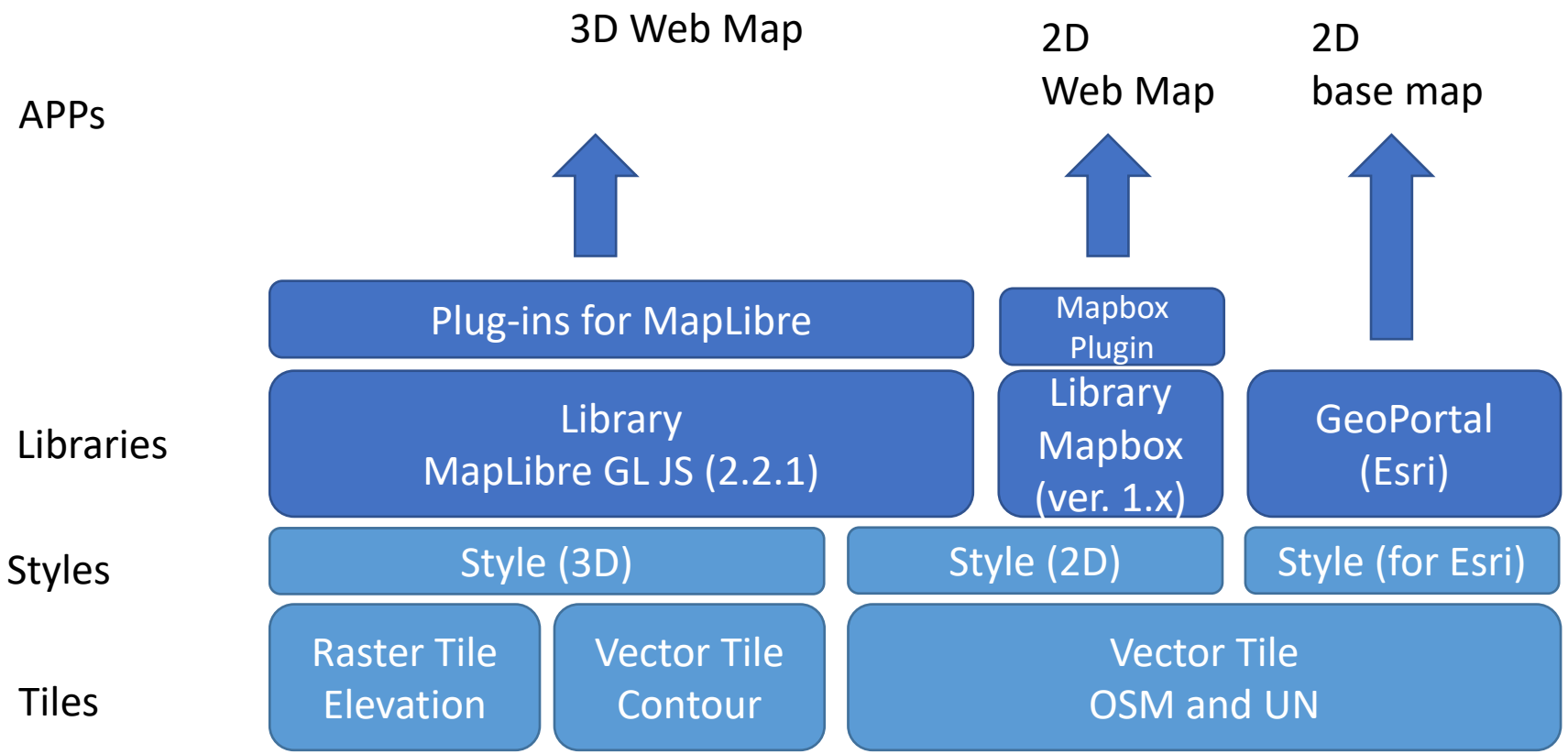

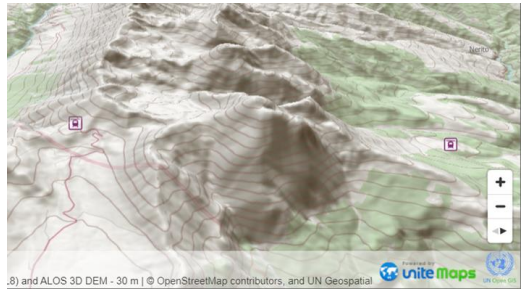

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UN experience: Vector Tile in ArcGIS Online

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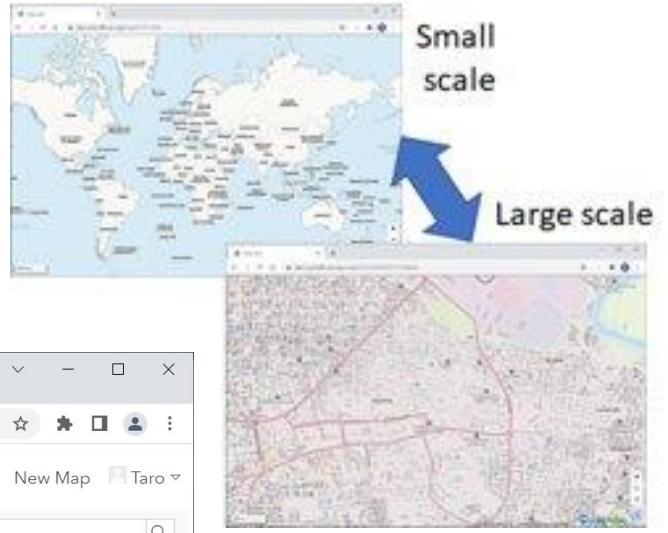
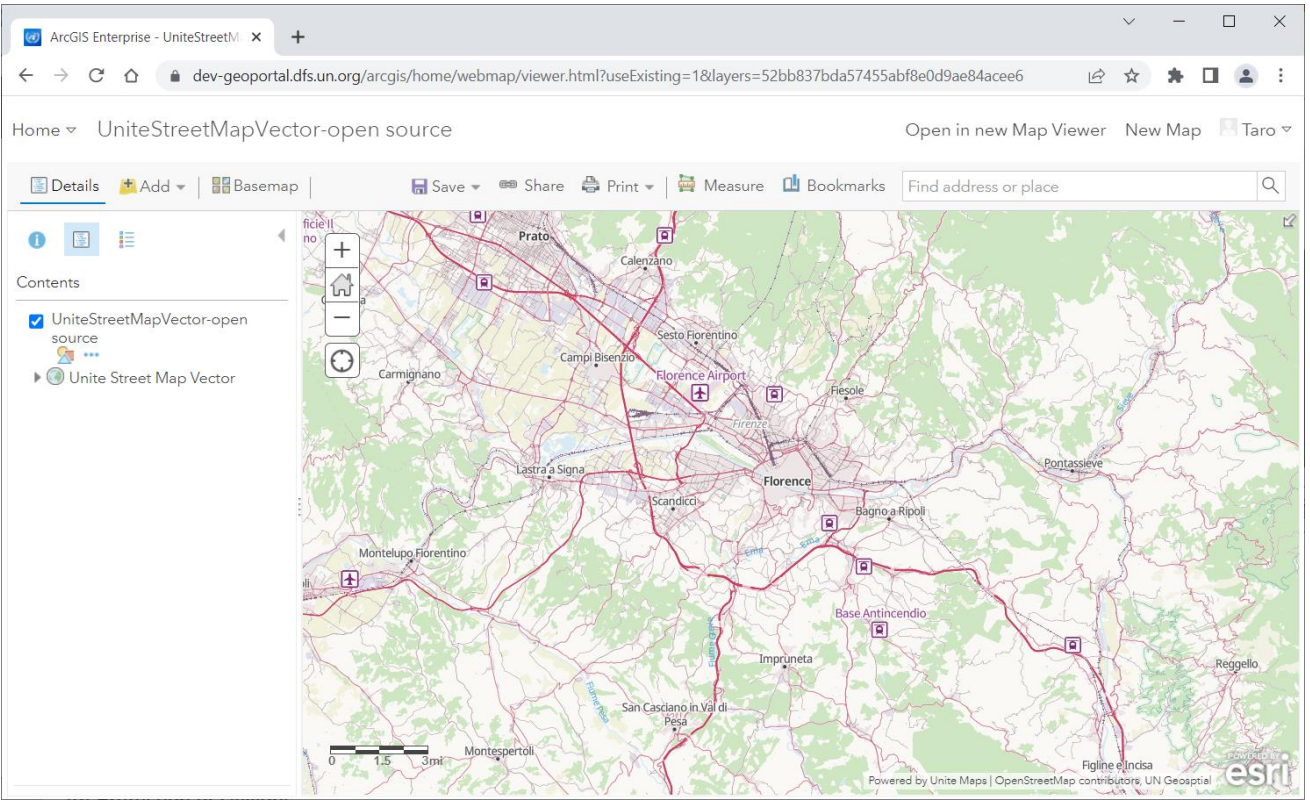
We have developed some interface with ArcGIS online for vector tile consumption.

We struggled and have a lot of lessons.





What we developed for our nodejs server:

- Interface with ArcGIS REST API
  - Style, index
  - Tilemap (for OverZoom)
- Azure AD authentication
- CORS setting (enabled)

Try https://github.com/unvt/itoma
(https would be needed.)

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UN experience: Use of various plug-in

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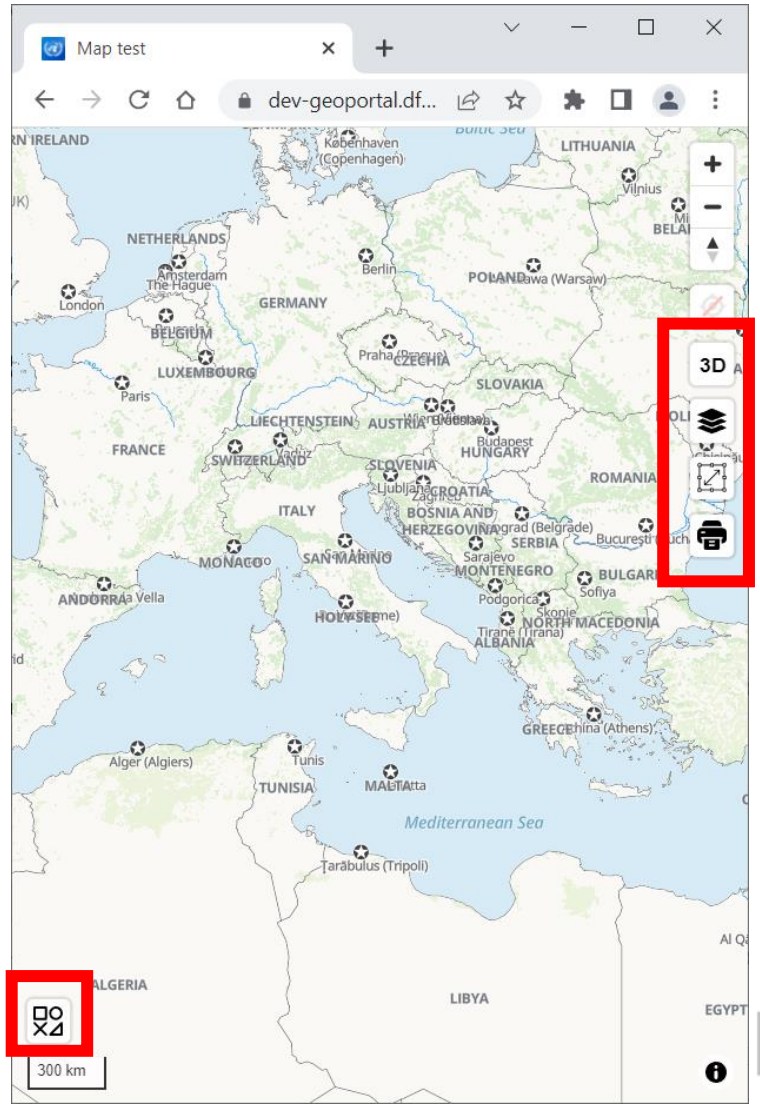
- We learn various plug-ins from partners' projects.

In particular, thank you **watergis** (Jin Igarashi) for sharing your knowledge!

Plug-in	MapBox	MapLibre
StyleSwitcherControl	el/style-switcher, watergis/style-switcher	N/A (ver 1.14 or prior)
PopupControl	watergis/mapbox-gl-popup	N/A
PitchToggleControl	tobinbradley/mapbox-gl-pitch-toggle-control, watergis/mapbox-gl-pitch-toggle-control	N/A
AreaSwitcherControl	watergis/mapbox-gl-area-switcher	N/A
LegendControl	watergis/mapbox-gl-legend	watergis/maplibre-gl-legend
ExportControl	watergis/mapbox-gl-export, geolonia/mbgl-export-control	watergis/maplibre-gl-export
ElevationControl	watergis/mapbox-gl-elevation	N/A
Geocoder	mapbox-gl-geocoder	maplibre-gl-geocoder



Geospatial

UNVT Portable

- Efforts by Furuhashi lab.

The United Nations Vector Tile Toolkit

UNVT Portable

with Crisis Mappers Japan and Aoyama Gakuin Univ.

- For disaster damage assessment by Municipality Governments.
- Collaborative project of governments, academia and civic tech communities.
- Raspberry Pi implementation of UNVT will be used to provide orthoimages overlaid with basemap vector tiles on mobile devices through Direct Wi-Fi Connection.

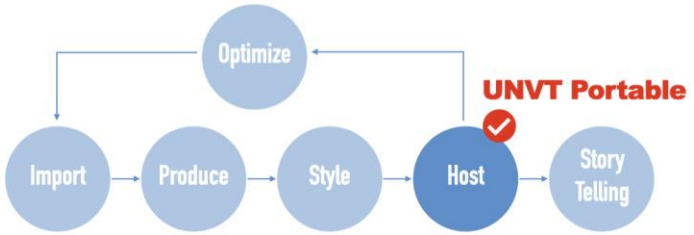


Fig. UNVT Structure

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How we share our experiences?

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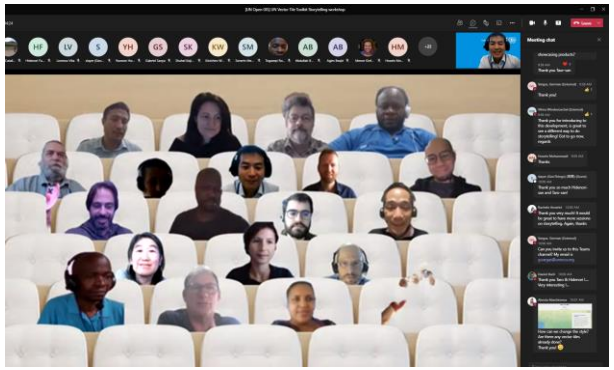
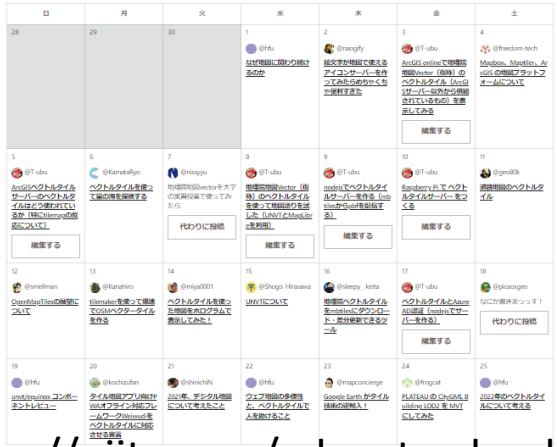
- **Conduct workshops**



- **Documentations**

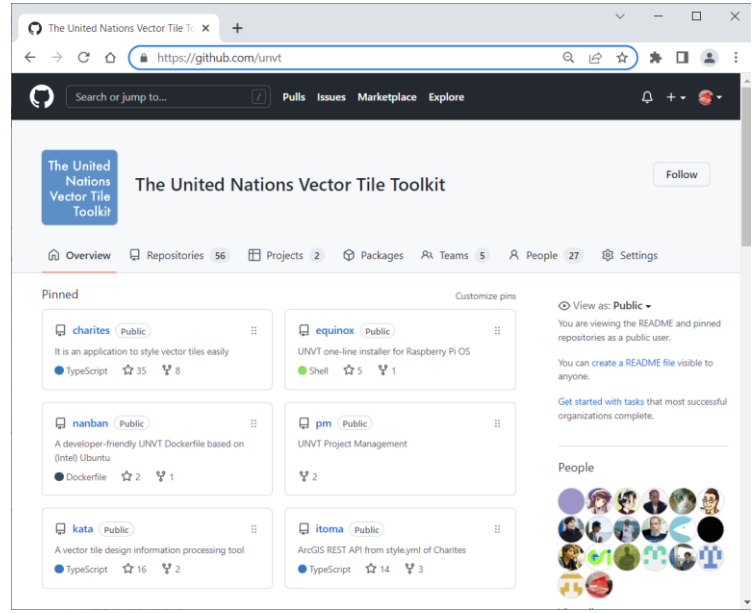
Vector Tile Advent Calendar 2021
(Dec 2021, an article a day)



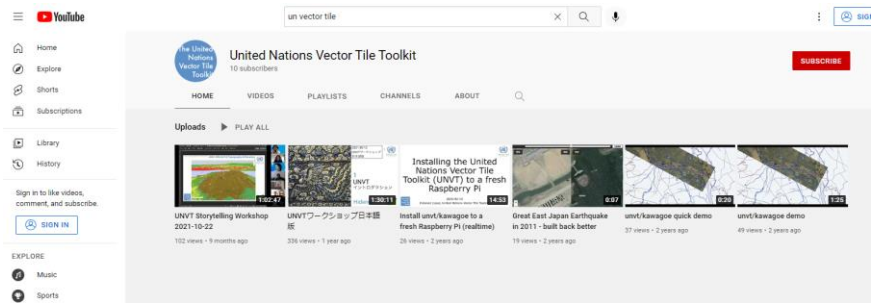
https://qiita.com/advent-calendar/2021/vt

- **At GitHub**

https://github.com/unvt



- **YouTube**



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Summary and Way Forward

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- UN Vector Tile Toolkit is a joint effort to support various vector tile operations (produce, style, host, optimize, use).

- Each participants can feely use our tool to operate web map, and we see the great value in sharing technical experiences through the initiative.
  And we just continue our vector tile operations.

- I showed some examples today. Feel free to join us to explorer new techniques together!

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