OpenWebGlobe

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WebGL

- 3D Graphics on the Web *(based on OpenGL ES 2.0)*
- Rendering interactive 2D/3D graphics within the webbrowser
- Highly Optimized for JavaScript
- Hardware acceleration using the Graphics Processing Unit (GPU)
- WebGL programs consist of:
  - application code written in JavaScript (CPU) and
  - shader code (GLSL) for the GPU
- No plugin for these (desktop) browsers:

(11+)

OpenWebGlobe

WebGL

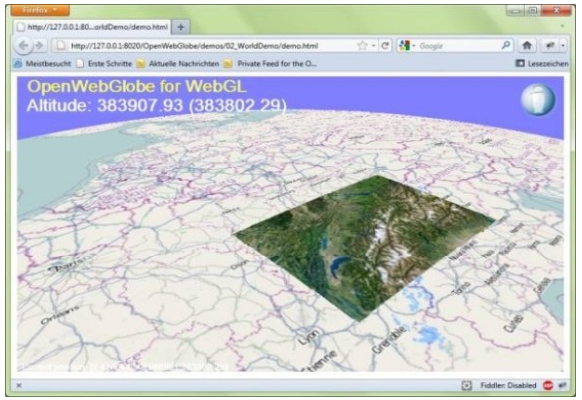
- Virtual Globe without plugins for modern webbrowsers, using WebGL
- Open Source Project started in April 2011
  (based on C++ version started in 2005)
- JavaScript Library for rapid development of web-based 3D geoinformation applications
- Full integration into customer web sites
- Runs on Windows, MacOS X, Linux

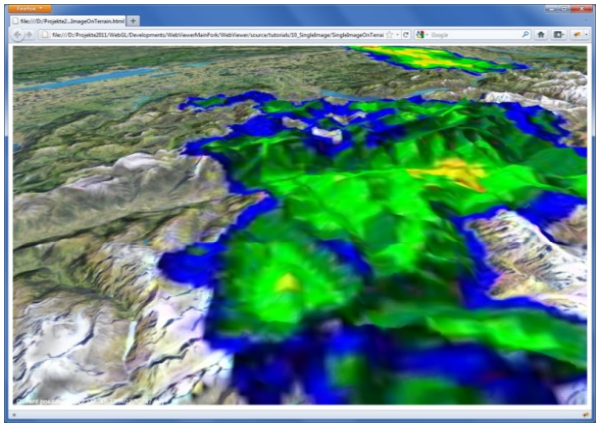
Demo

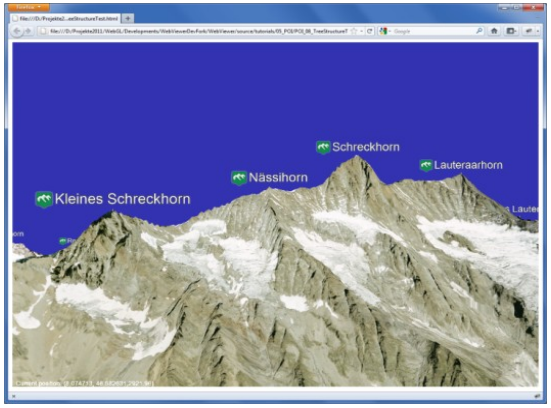

http://world.openwebglobe.org
http://swiss3d.openwebglobe.org
Fork me on GitHub
OpenWebGlobe
Data Layer
World
Overlays
Elevation
Animate
Tweet

Layers / Contents

- Imagery / Elevation
- POIs
- 3D Models
- HTML5 Canvas Element
- Overlays
- Point Clouds







Hello World

```
<!DOCTYPE html>
<html>
<meta "charset=utf-8" />

<script type="text/javascript" src="http://www.openwebglobe.org/js/openwebglobe-0.9.8.js"></script>

<script type="text/javascript">
   function main()
   {
      ogSetArtworkDirectory("http://www.openwebglobe.org/art/");

      var ctx = ogCreateContextFromCanvas("canvas", true);
      var globe = ogCreateGlobe(ctx);

      var imgBlueMarble500 =
      {
         url     : ["http://www.openwebglobe.org/data/img"],
         layer   : "World500",
         service : "i3d"
      };
      ogAddImageLayer(globe, imgBlueMarble500);

   }
</script>

</head>
<body onload="main()" style="padding:0px; margin:0px; overflow:hidden;">
   <canvas id="canvas"></canvas>
</body>
</html>
```

http://jsbin.com/owg_layer_example/1/edit

Global Datasets in 2D

First we need to understand how global 2D maps work.

OpenStreetMap, Google Maps, Bing Maps, ...

Theoretical example Earth:

- Land area of around 148.9 Mio. km^2 (~ 29%)
- Water area of around 361.2 Mio. km^2 (~ 71%)

If we had a global dataset with 25cm^2 / Pixel:

- Land area (uncompressed) around 170 Petabytes

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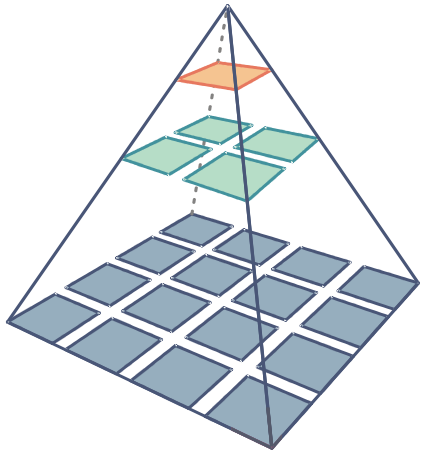
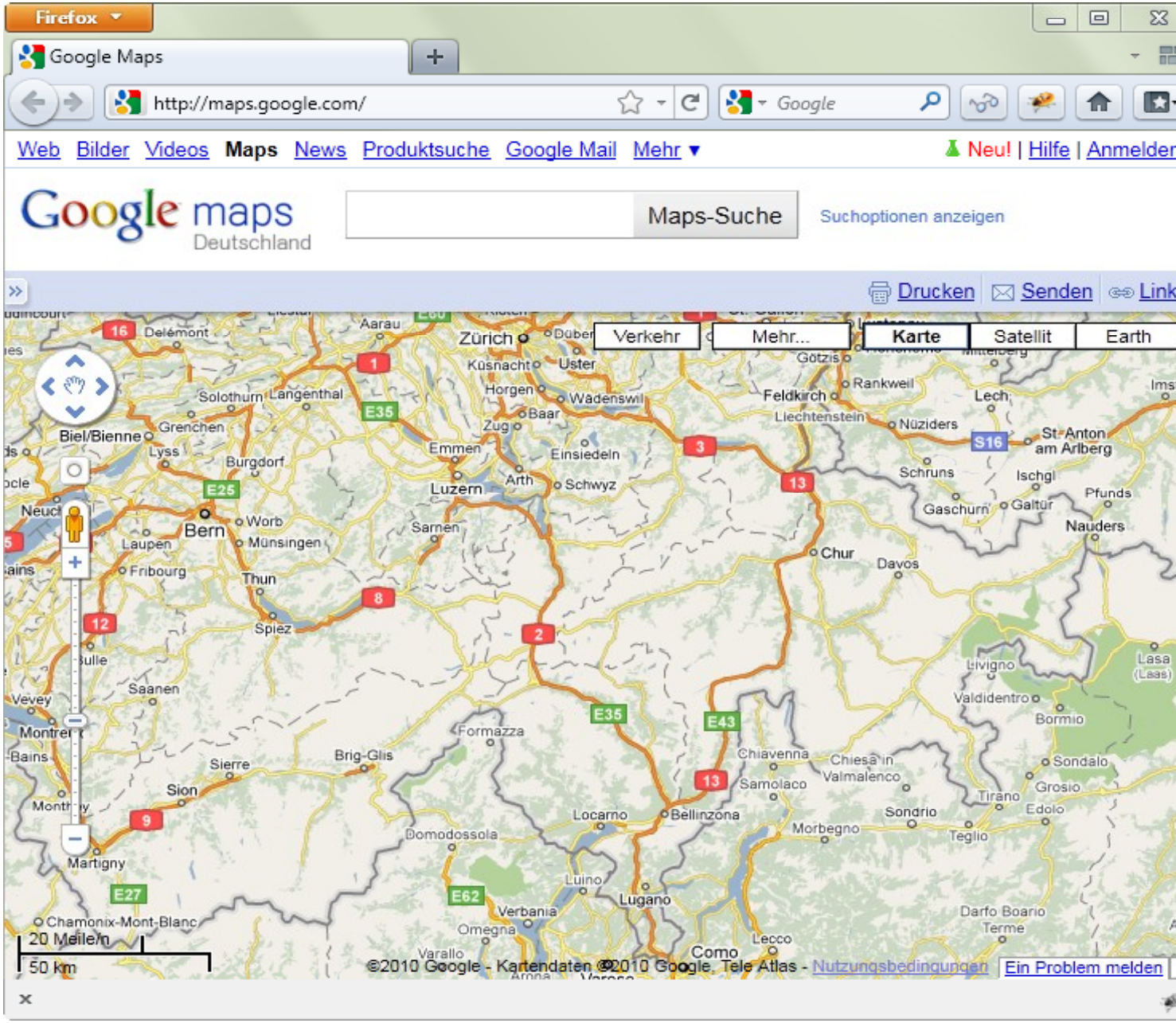
2D Tiles



Always one zoom level visible

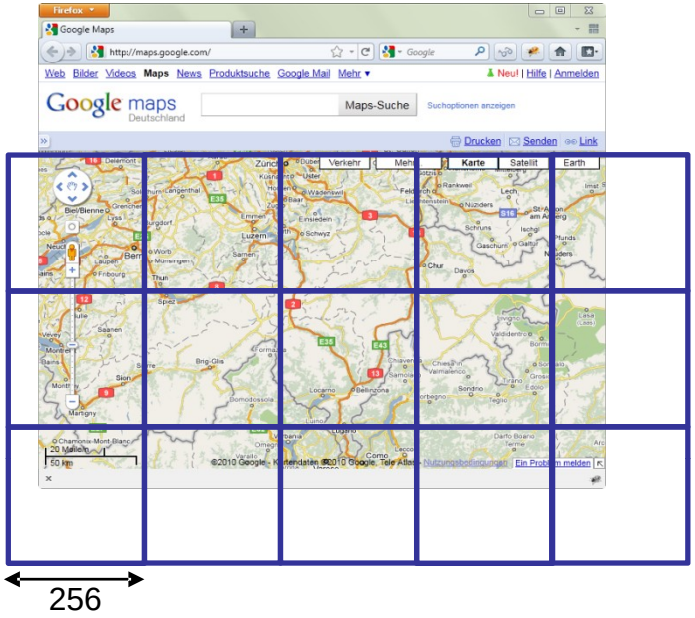
User zooms in/out
(GUI / mouse wheel)

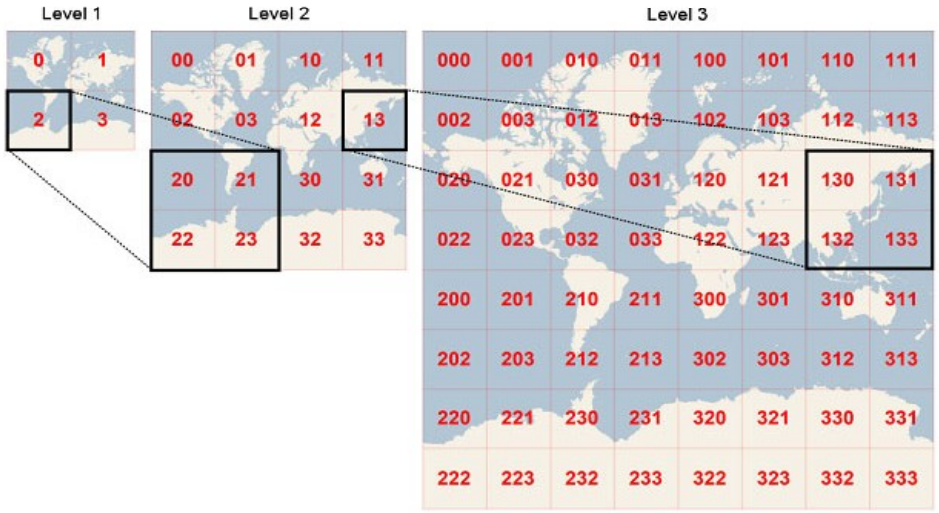
Only **required** data ("visible data")
is requested from the server (or
cloud)



Screenshots from Google Map

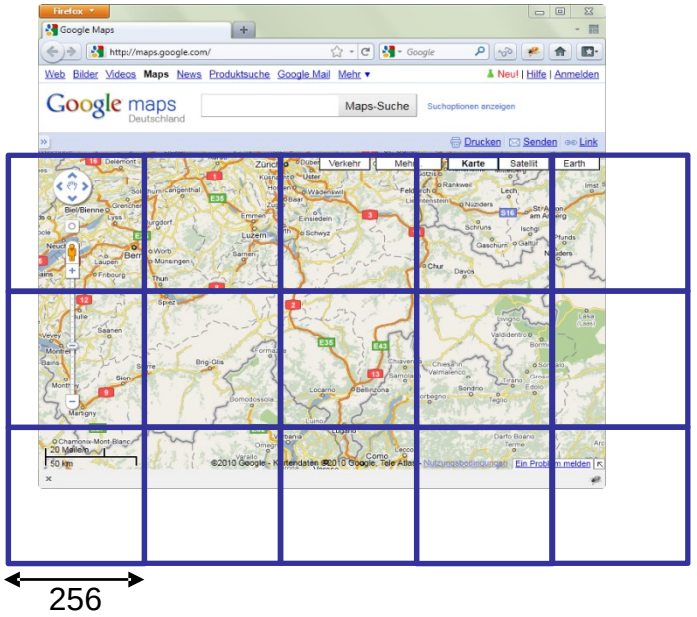
2D Maps – Quadtree structure





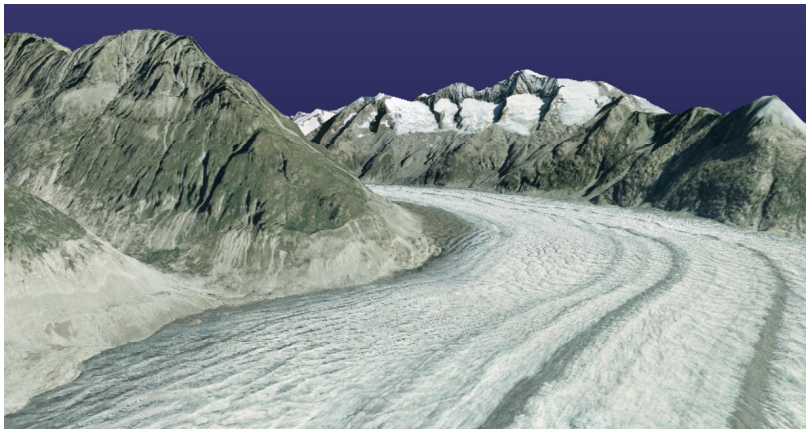
(Image courtesy of Microsoft, Bing Maps)

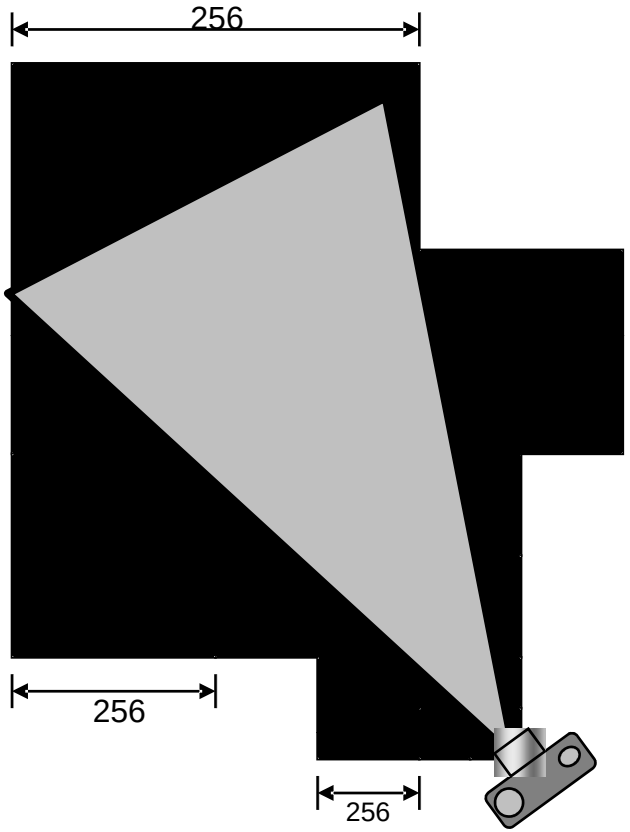
The Step to 3D



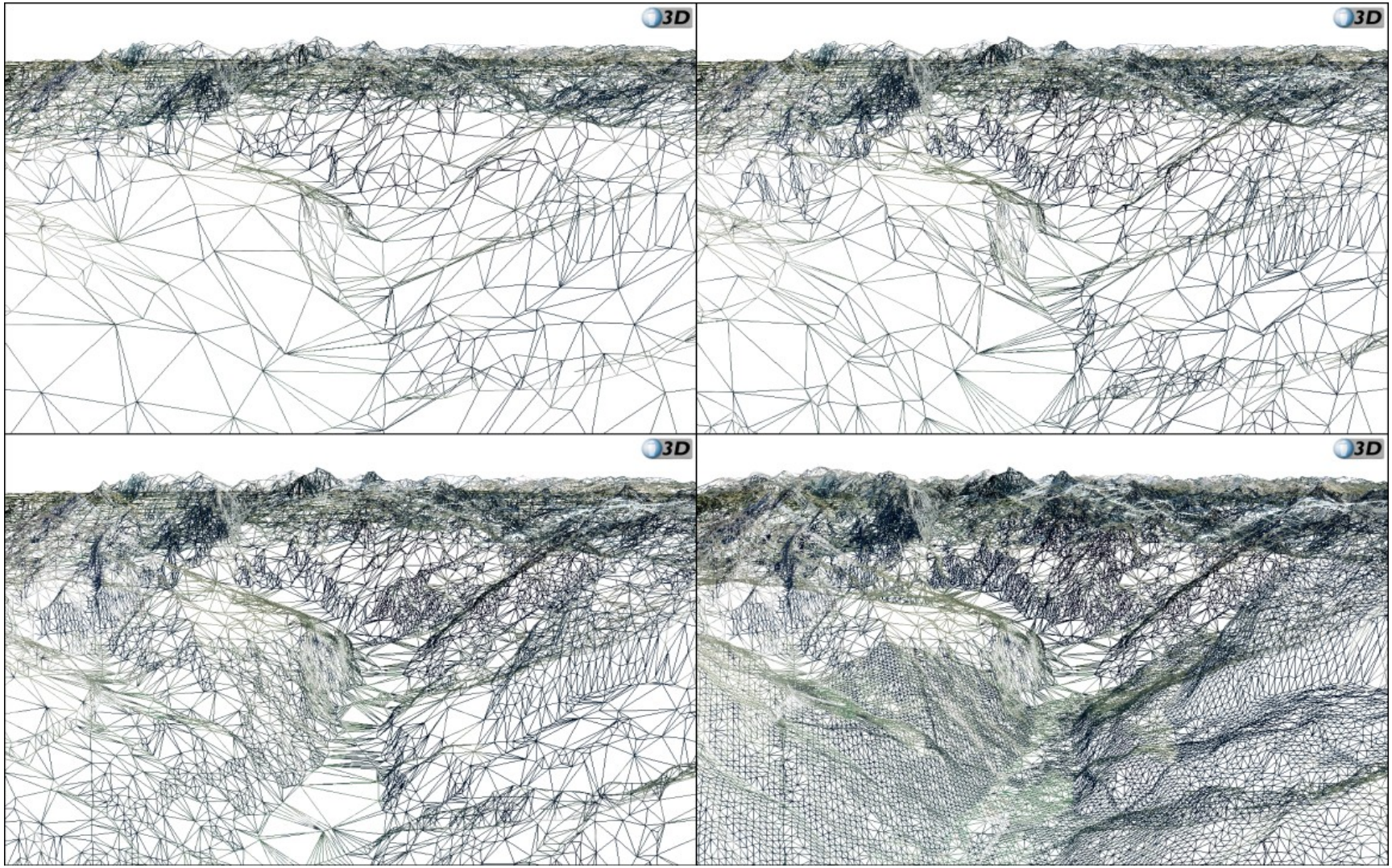
Basically the same like 2D, however:

- The View Frustum contains different LOD
- Level of detail depends on camera position.
- Elevation data can be displayed (change of perspective)





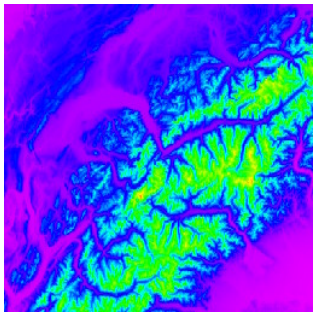
OpenWebGlobe: 2.5D Elevation Tiles (Level of Detail)



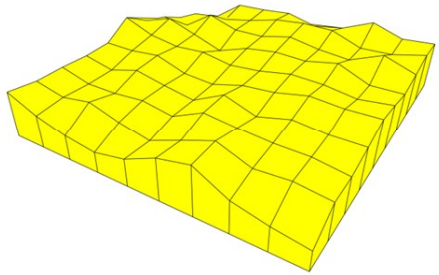
Important Tile Types

2D Image Tile
contents: 256x256 Pixels (in most cases)
(May also contain rasterized vectors etc.)

2D Vector Tile
contents: 2D Geometry
(Number of Elements limited for LOD)



2D Elevation Tile (-> for creating 3D Tiles)
contents: Elevation values (e.g. numbers)
contents 17x17 values (or similar).



Solution #1:
Preprocessing all tiles in the cloud

Other Data Sources

–WMS, WMTS, TMS, ...
–Postgres / PostGIS
–3DPS *(in Future)*

download visible data fragments (tiles)

Generate tiles
(for Streaming)

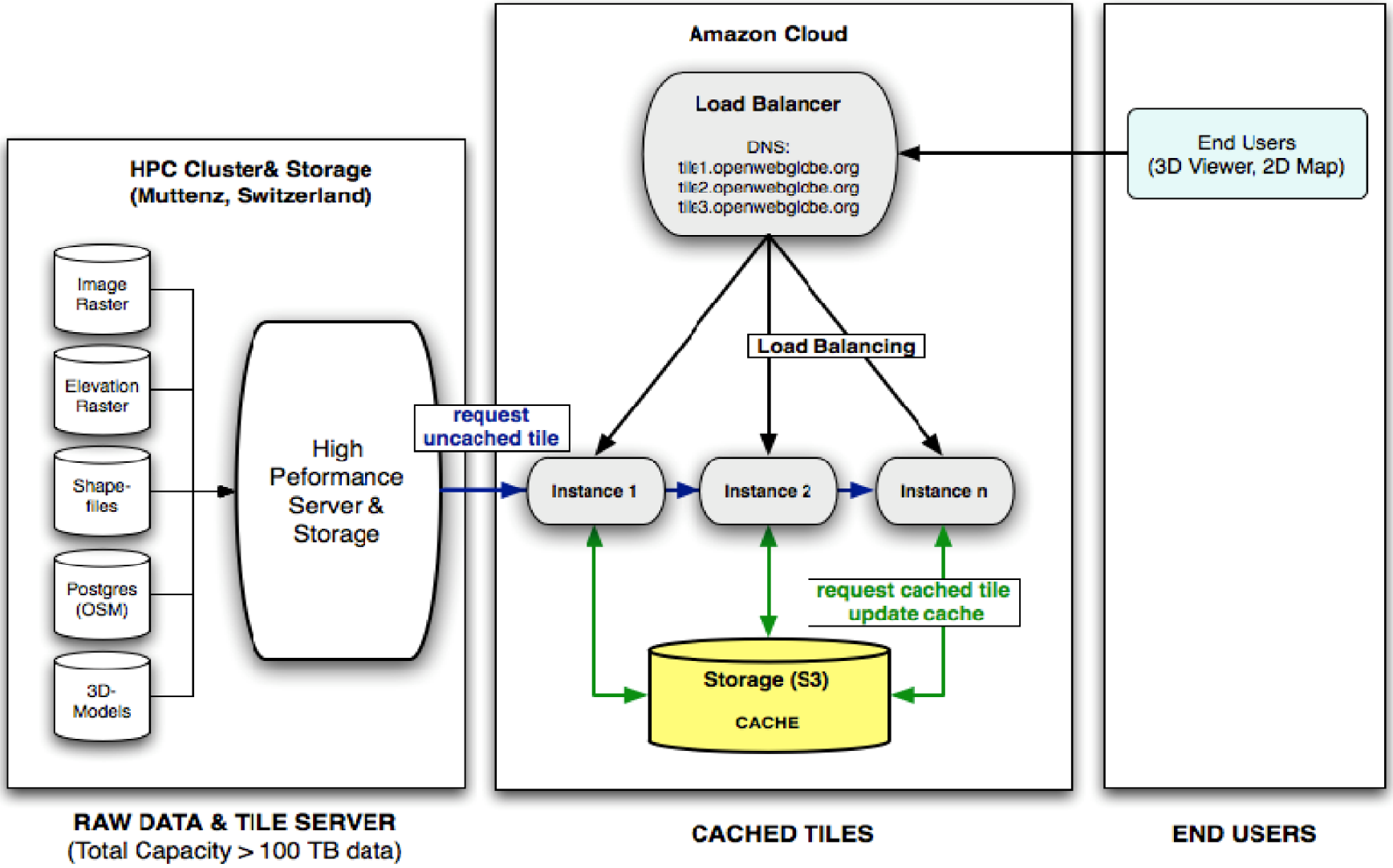
(Web-) Viewer

–HTML5
–JavaScript
–WebGL for 3D

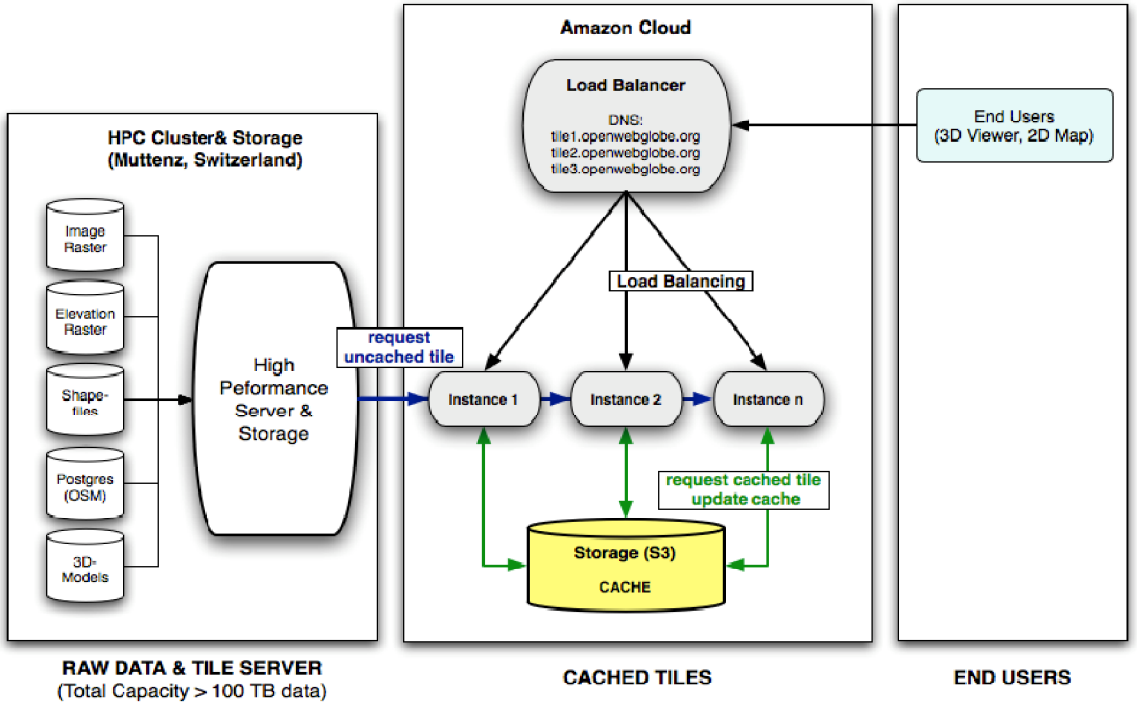
Upload **Raw data** to Cloud
(or web server)

Raw: Image, Elevation, 3D-Models, Point Clouds, ...

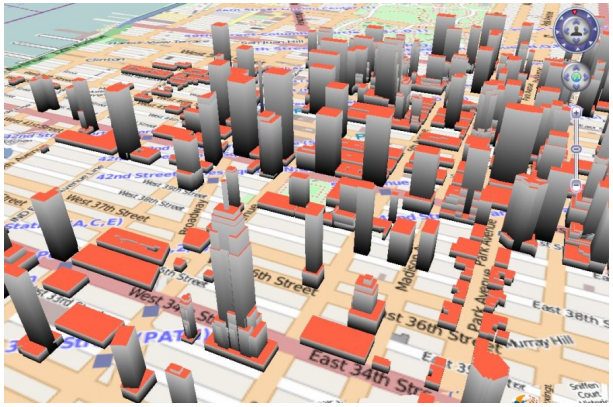
Solution #2:
Partial Preprocessing Tiles & On-The-Fly Tile Generation and Caching



HPC: 120 TB Data (900MB/s), >50 CPU Cores in combination with cloud



Showcase: Streaming 3D-Geometry Tiles (from OSM data & Buildings of Interest)
Bachelor Thesis / Master Thesis @FHNW IVGI



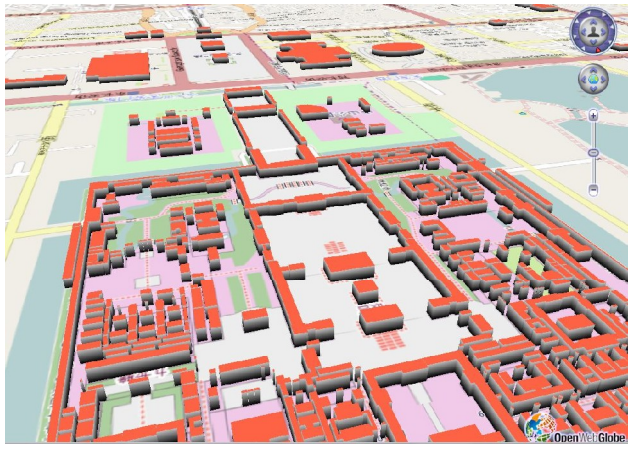
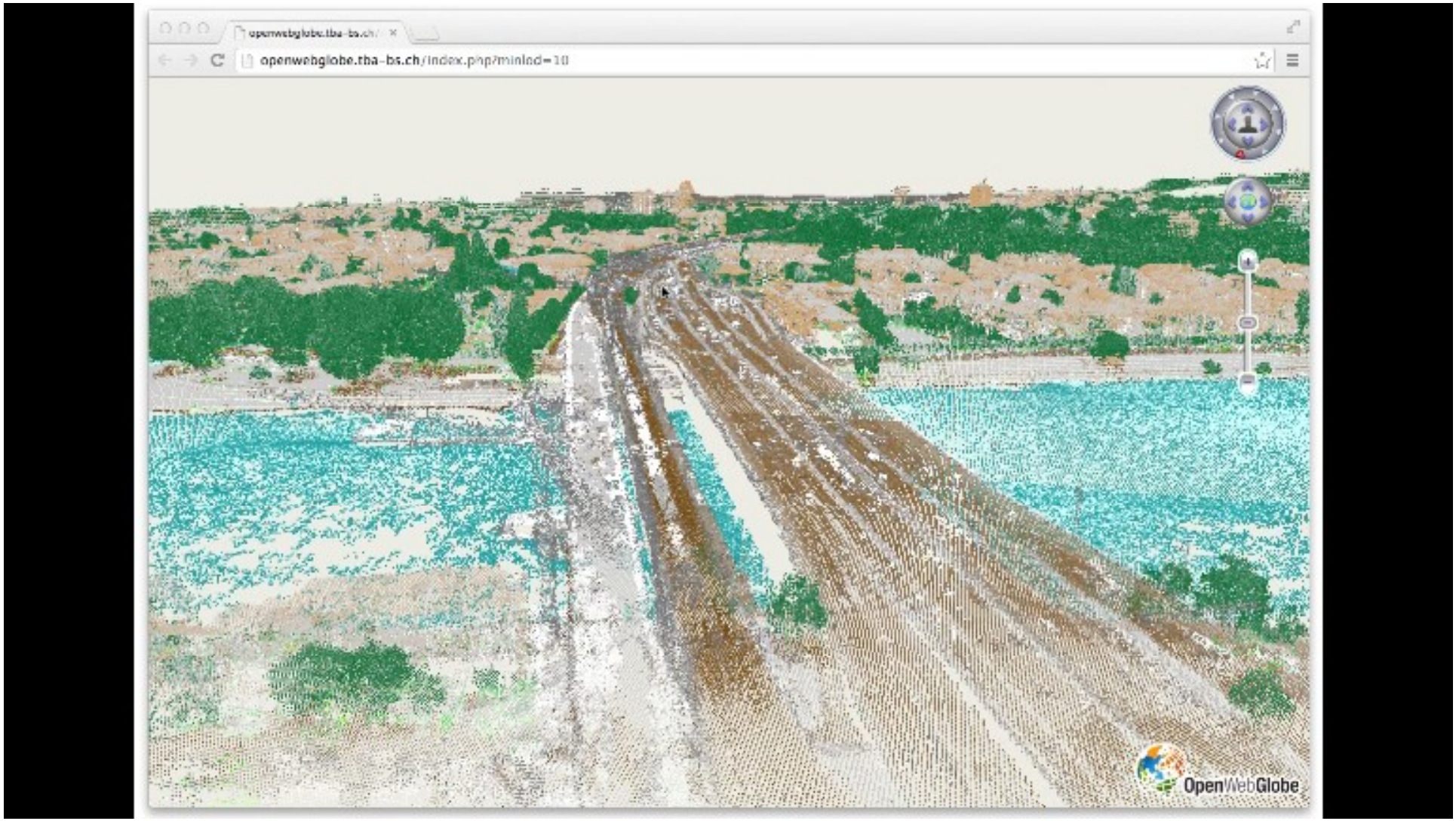


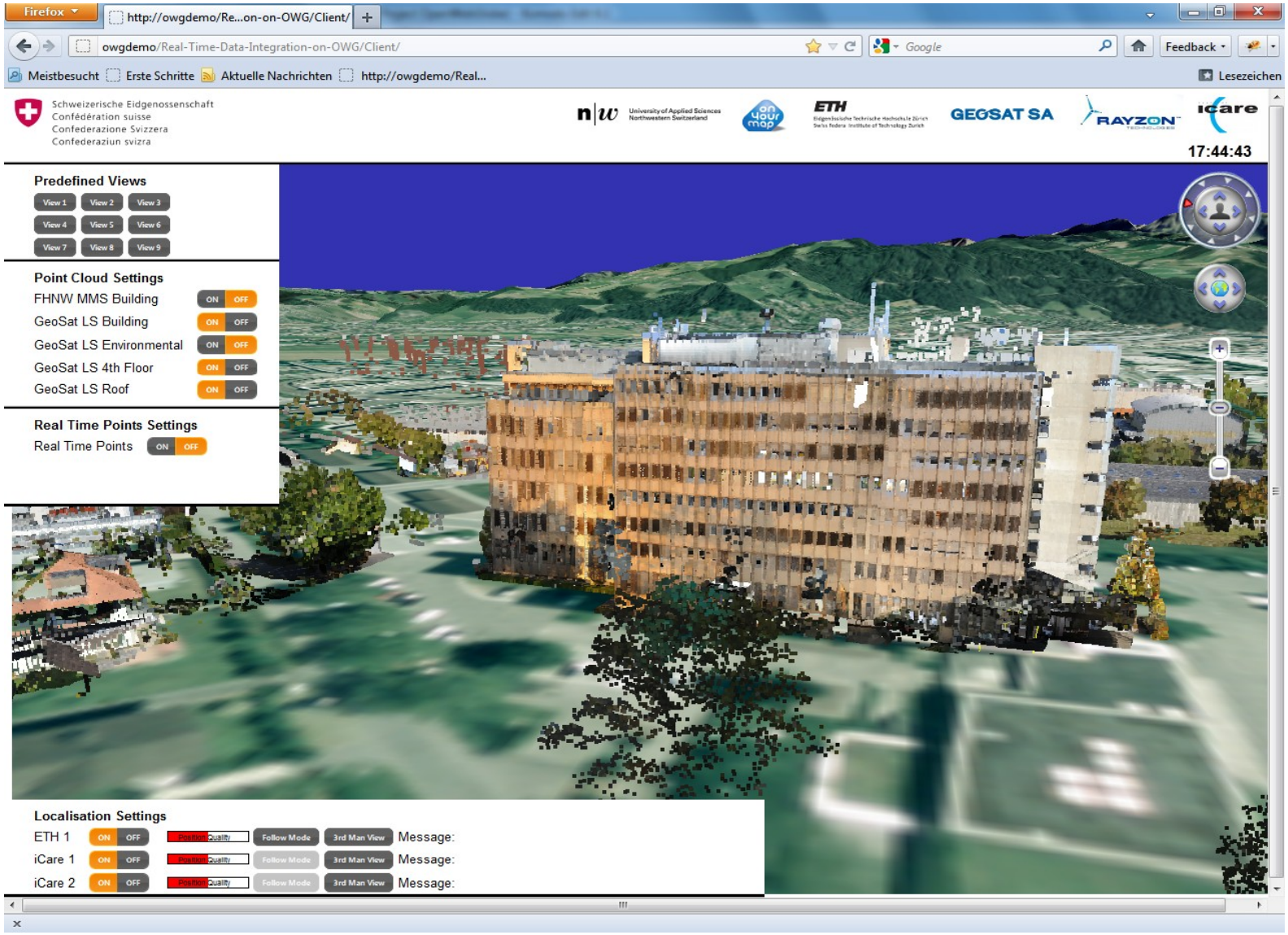
Image courtesy of BTh Hürbi/Daetwyler, MTh Lucas Oertli, 2013


Toolbox
?
Zoom to FHNW
Weltansicht
Fullscreen
Fly to BOI
Fly to AOI
OSM
OWG
Elevation On
Elevation Off
3D OSM
3D AOI
3D Off
Cache On
Cache Off
Fachhochschule Nordwestschweiz
Hochschule für Architektur, Bau und Geomatik
mongoDB
node
OpenWebGlobe

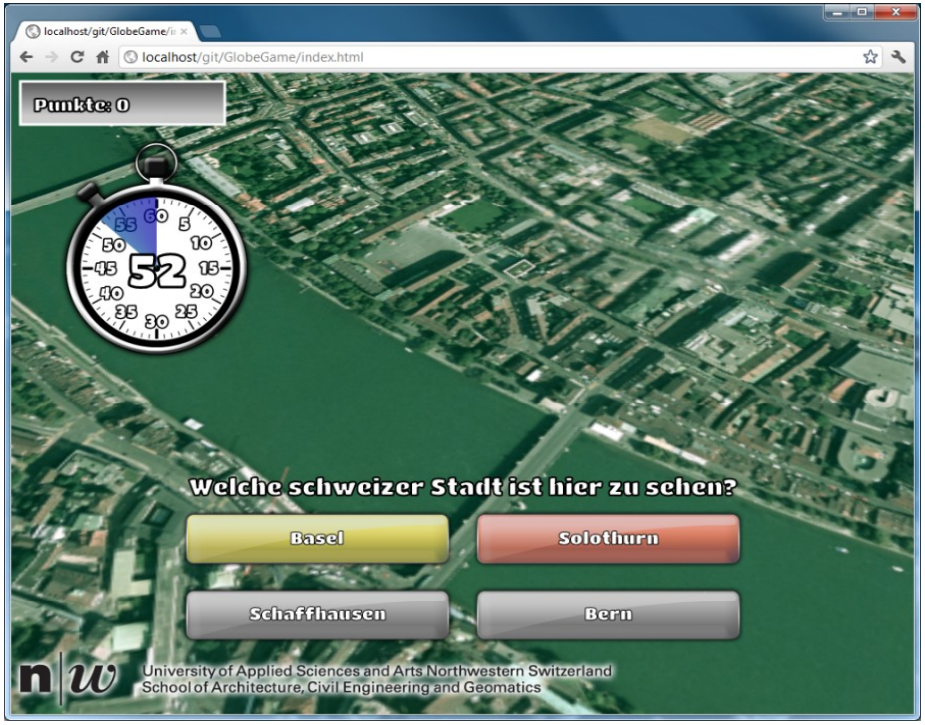
Demo (Civil Engineering Department Basel-Stadt)

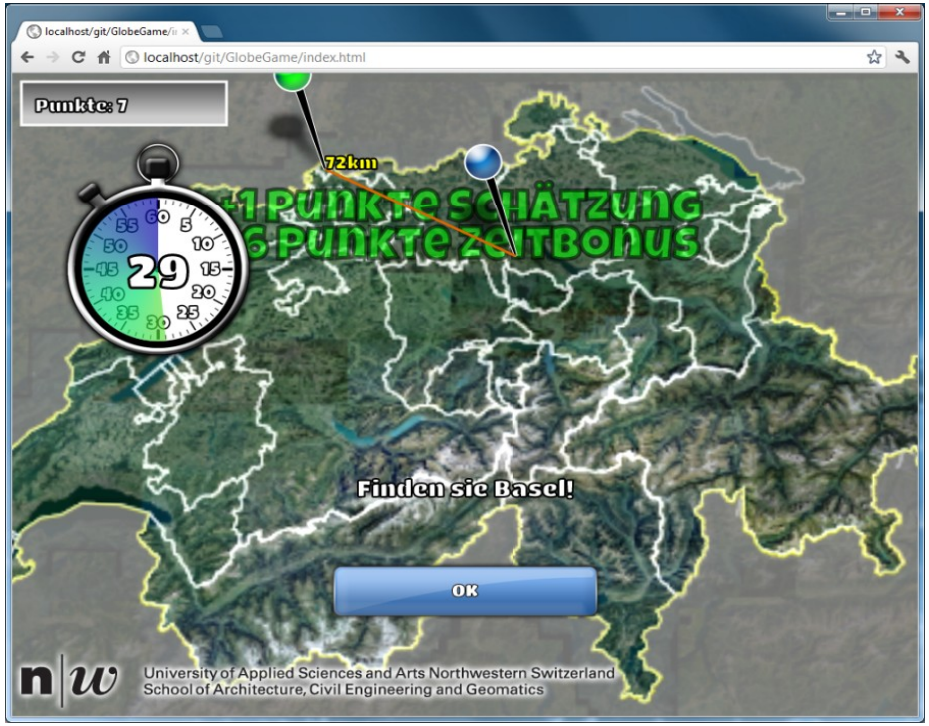


ShowCase: Rapid 3D Mapping



ShowCase: SwizzQuiz – Interactive Geo Game





In Development:

OpenWebGlobe 2

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OpenWebGlobe 2

Some features:

- Easier Data Processing & Cloud Setup
- Create Native iOS, Android, Windows Phone Applications
- Create Native Desktop Applications
- Browser Support using WebGL
- Improved Speed
  - Faster downloads
  - Improved Graphics
- Streaming all Layers (Image, Elevation, 3D, PC, ...)

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Augmented Maps

Conclusion

- OpenWebGlobe – an Open Source Platform for
  - Visualization of a virtual globe on the Web
  - Processing 2D and 3D- Data for streaming large scale data

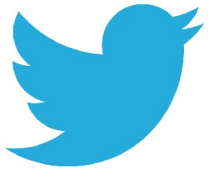
- Streaming large Scale Dataset requires new standards

- 2D & 3D Tiles... almost the same... but very different

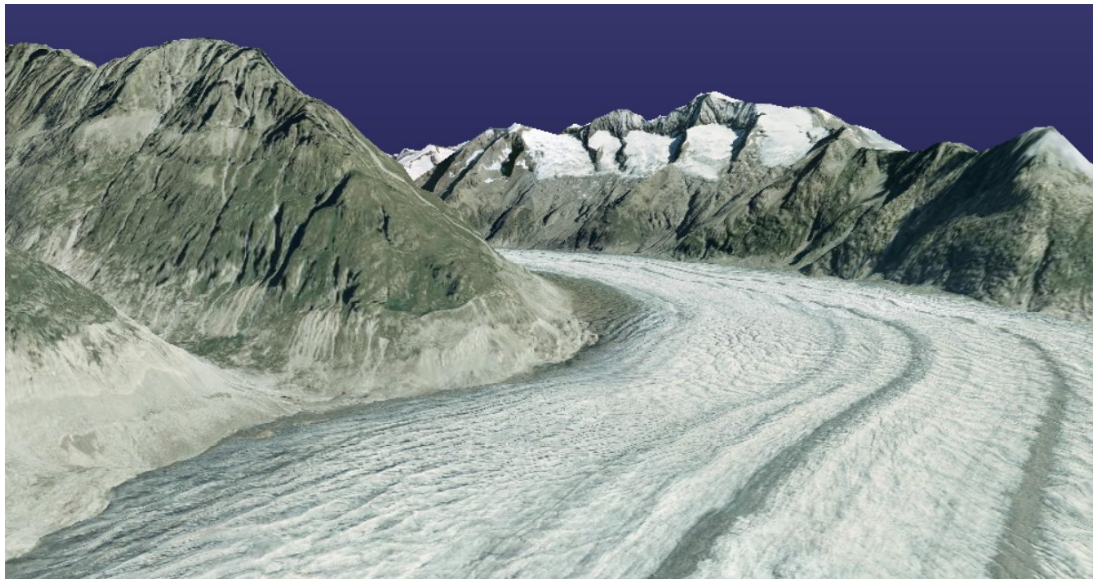
- New possibilities
  - Scale Point Cloud Streaming
  - Augmented 3D Maps

Questions ?

https://github.com/OpenWebGlobe



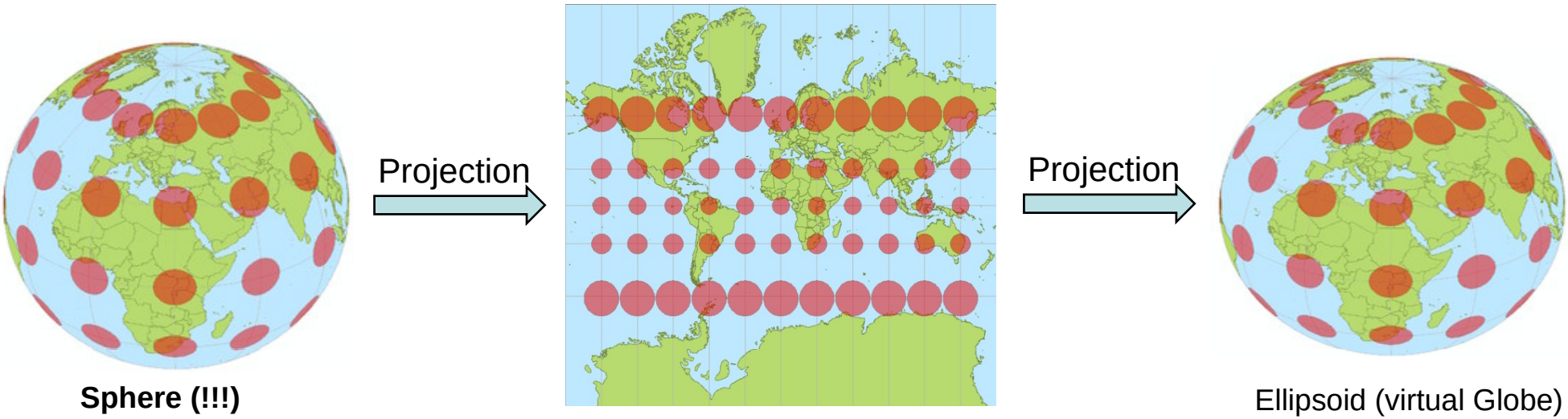
@OpenWebGlobe
@MartinChristen



MapData © MapPuls, ASTER GDEMv2, Landsat

"Web Mercator" / "Popular Visualization Pseudo Mercator"

- Min/Max Latitude at around +-85 degrees (-> square map...)
- Projection: **Sphere** (!) with radius of 6378137m
- Invented by Google, unfortunatly many web maps use it today (Reason was performance, but that is not really the case)
- **"almost conformal" projection.**
- EPSG:3857 *(don't use EPSG: 900913)*



3D Tiles ?