

ptolemy

Rendering OpenStreetMap on the OpenWeb

MunichJS - 11/2013 - @jviereck

Did you use a map to
get here?

Who uses a Map?

Maps out there

- Google Maps (2005)
- Nokia HERE Maps
 - Bing Maps
 - Amazon Maps
 - “Car” Maps
- Apple Maps (2012)
- OpenStreetMaps

Maps running in the browser

- Google Maps
- Nokia HERE Maps
 - Bing Maps
- OpenStreetMaps

Offline Support?

Seems like no
problem until now...

... unless you build
a OS using OpenWeb

FirefoxOS

“The web is the platform.”



#1 FirefoxOS Question:

Q: “What if I am offline?”

A: “It works as well.” ... or not?”

New kid in town:

OFFLINE FIRST

ABOUT & TEAM
CONTACT
HOODIE WEBSITE

RECENTLY POSTED

TGIF! (13): OPEN DOORS, PUT EVERYONE ON SUPPORT, UNBRAND YOUR LIFE, BLOCK SURVEILLANCE, HAVE A .PIZZA AND GET KURT COBAIN'S COLLEGE HAIRCUT

NODESCHOOL LONDON

TGIF! (12): THINK TWICE BEFORE YOU KICKSTARTER, UNDERSTAND METAPHORS, BEAT THE JANKEN ROBOT, EXPERIENCE WONDERS AND DON'T FEEL ASHAMED



SAY HELLO TO OFFLINE FIRST

([Russian translation](#) by [@kouprianov](#))

The members of [Team Hoodie](#) are currently travelling around quite a bit, organising, participating in and attending conferences and workshops in various countries, and through all this we've not only made lots of personal experiences with limited network connectivity, but also met many people from all over the world, all with their own related stories and problems.

There is no offline map on the OpenWebPlatform

That is sad :(

Lets fix this :)

ptolemy

- Prototype developed by Mozilla
 - ! No product planed
- Goal: Can the OpenWeb
 - render maps
 - make them available offline
 - work on FirefoxOS (low budget phones)
- OpenSource: <https://github.com/fzzzy/ptolemy>

High level overview

- **Backend**

- Start with OpenStreetMap “raw” data
- Reduce, group, combine data
- => Write binary file

- **Frontend**

- Load binary file to IndexedDB
- Render Map to HTML5 Canvas (LeafletJS as viewer)

OpenWeb <3 Open Formats

=> look at OpenStreetMap

Let's start with
some theory ;)

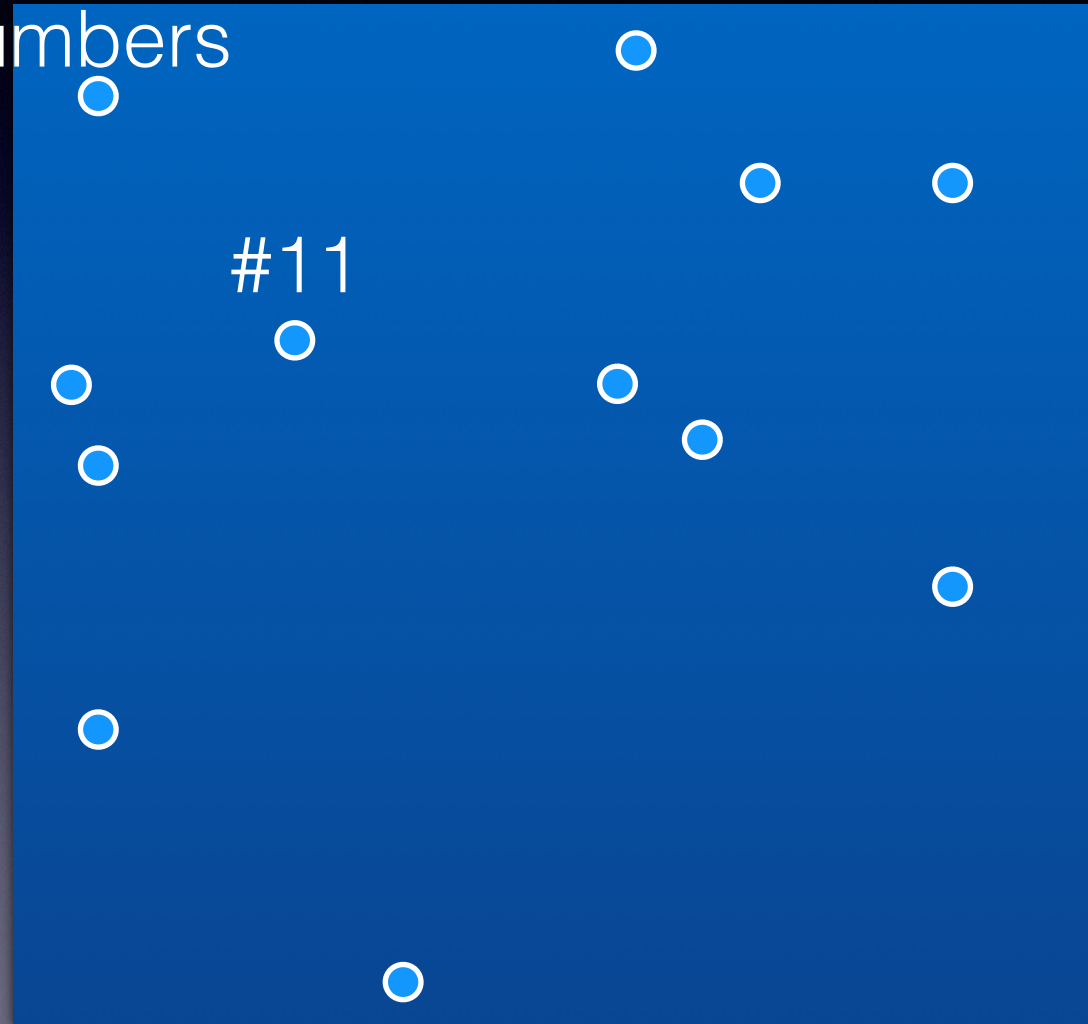
OpenStreetMap Format

- XML format
- three main parts:
 - Nodes
 - Ways
 - Relations

Let's look at the
three main parts
one after the other

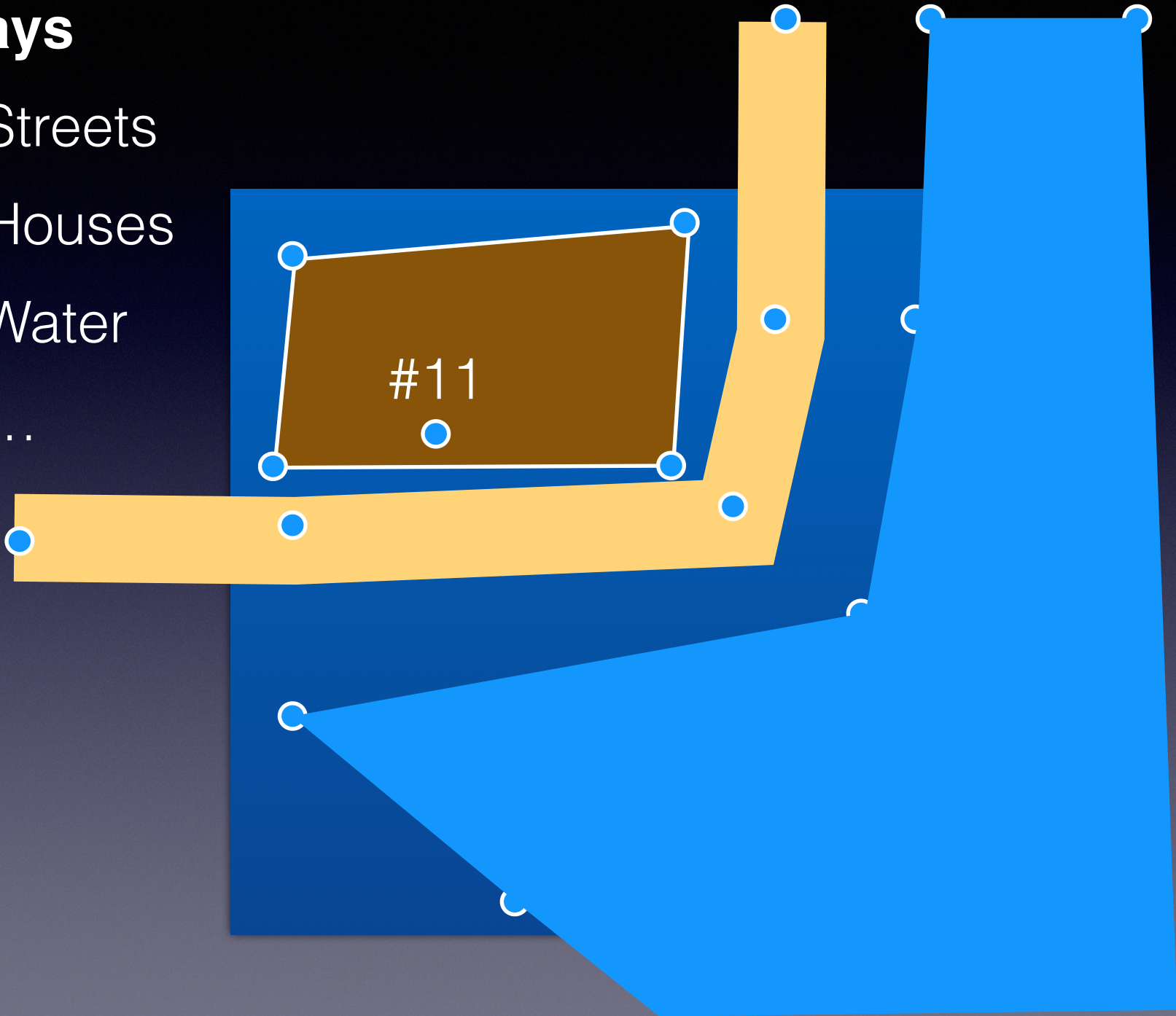
Nodes

- Points
- House numbers
- ...



Ways

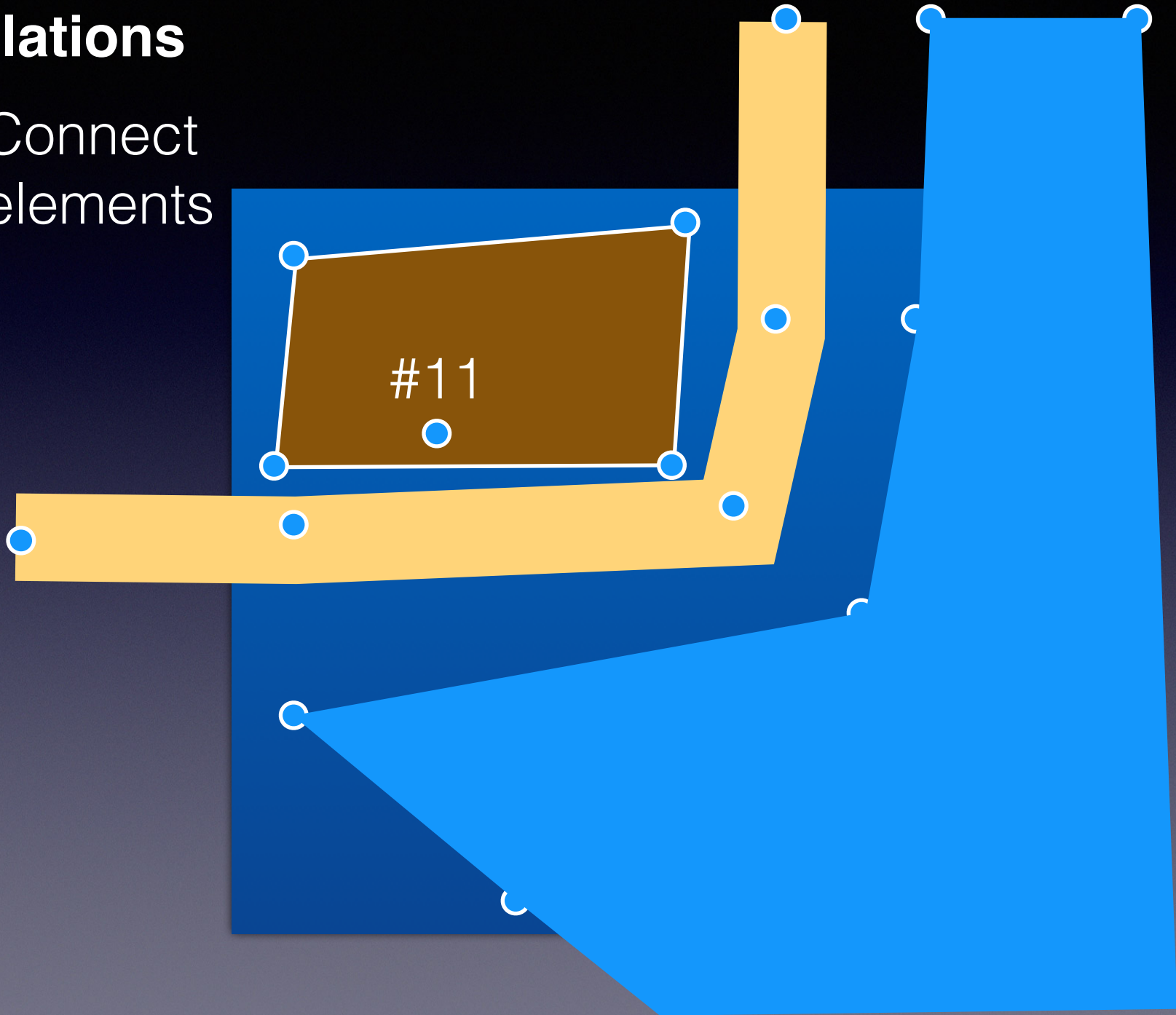
- Streets
- Houses
- Water
- ...



e.g.: “All this is Munich”

Relations

- Connect elements



The “raw” format

```
<node id="1955347" visible="true" version="10"
  changeset="11581522"
  timestamp="2012-05-12T23:05:14Z" user="sendelhorst"
  uid="46472" lat="48.1317293" lon="11.5630365">
  <tag k="bicycle" v="yes"/>
  <tag k="crossing" v="traffic_signals"/>
  <tag k="highway" v="traffic_signals"/>
</node>
```


Lookup a node

- <http://www.openstreetmap.org/browse/node/1955347>

The screenshot shows the OpenStreetMap website interface. The browser address bar displays www.openstreetmap.org/browse/node/1955347. The page title is "Node: 1955347". Below the title are links for "Download XML", "View history", and "Edit node". The left sidebar contains the OpenStreetMap logo, a description of the project, and links for help, community, and data. The main content area displays the node's details:

- Edited at:** Sat, 12 May 2012 11:05:14 PM UTC
- Edited by:** [sendelhorst](#)
- Version:** 10
- In changeset:** [11581522](#)
- Comment:** Radl-Wege und -Routen Sendlin
- Tags:**
 - `bicycle` = yes
 - `crossing` = traffic_signals
 - `highway` = traffic_signals
- Coordinates:** 48.1317293, 11.5630365
- Part of:**
 - Ziemssenstraße (57205976)
 - Reisingerstraße (4673764)
 - Lindwurmstraße (52341874)
 - Lindwurmstraße (30751935)
 - Lindwurmstraße (30825293)

On the right, there is a map view showing the node's location at the intersection of Lindwurmstraße and Reisingerstraße. The map includes labels for nearby streets and points of interest like "Tribu Café Bar Lounge" and "Dialyse im Zentrum". Below the map are links for "View area on larger map", "Edit area", "View node on larger map", and "Edit node".

Big list of “features”





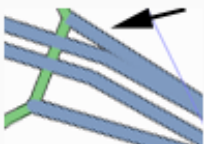





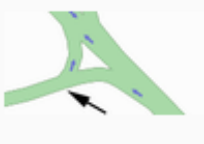





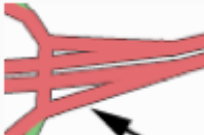
- See: http://wiki.openstreetmap.org/wiki/Map_Features

Highway						
Used to describe roads and footpaths. See Highways for further guidance and Restrictions for details of access limitations by vehicle type/ time/ day/ load/ purpose etc.						
Key	Value	Element	Comment	Rendering	Photo	
Roads						
highway	motorway		A restricted access major divided highway, normally with 2 or more running lanes plus emergency hard shoulder. Equivalent to the Freeway, Autobahn, etc..			
highway	motorway_link		The link roads (sliproads/ramps) leading to/from a motorway from/to a motorway or lower class highway. Normally with the same motorway restrictions.			
highway	trunk		Important roads that aren't motorways. Typically maintained by central, not local government. Need not necessarily be a divided highway. In the UK, all green signed A roads are, in OSM, classed as 'trunk'.			
highway	trunk_link		The link roads (sliproads/ramps) leading to/from a trunk road from/to a trunk road or lower class highway.			
highway	primary		Administrative classification in the UK, generally linking larger towns.			

Feature example: “Highway”

Highway

Used to describe roads and footpaths. See [Highways](#) for further guidance and [Restrictions](#) for details of access limitations by vehicle type/ time/ day/ load/ purpose etc.

Key	Value	Element	Comment	Rendering	Photo
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highway	trunk_link		The link roads (sliproads/ramps) leading to/from a trunk road from/to a trunk road or lower class highway.		
highway	primary		Administrative classification in the UK, generally linking larger towns.		
highway	primary_link		The link roads (sliproads/ramps) leading to/from a primary road from/to a primary road or lower class highway.		

- Remember: this is a prototype ;)
 - support only a small subset of features
 - no labels
 - no ... well, long list
 - => simplify features

List of “simplified” features

- waterA: 1, // Riverbanks
- waterB: 2, // River
- highwayA: 3, // HighwayA is the biggest street, while HighwayD is a small street.
- highwayB: 4,
- highwayC: 5,
- highwayD: 6,
- natural: 7,
- building: 8,
- landuse: 9

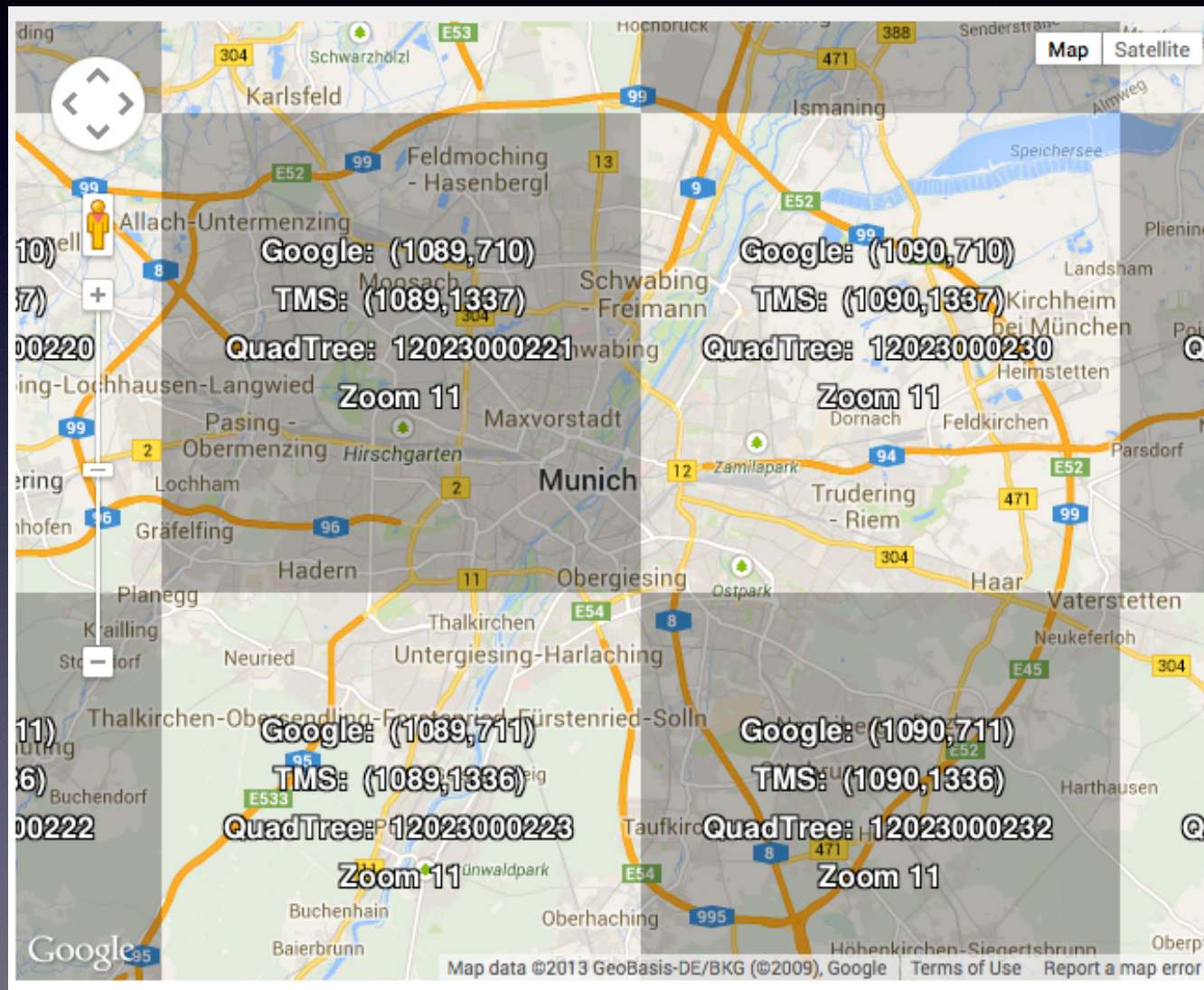
So far:

talked about content

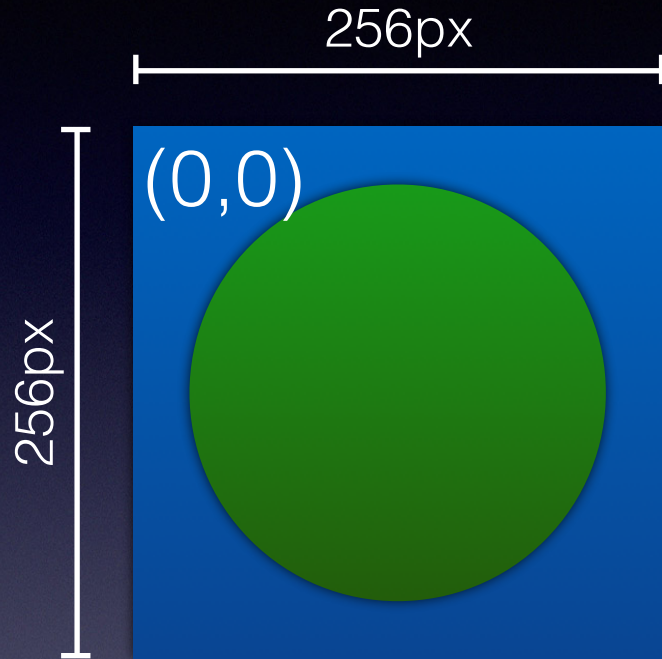
Now:

talk about map structure

Maps are tiled

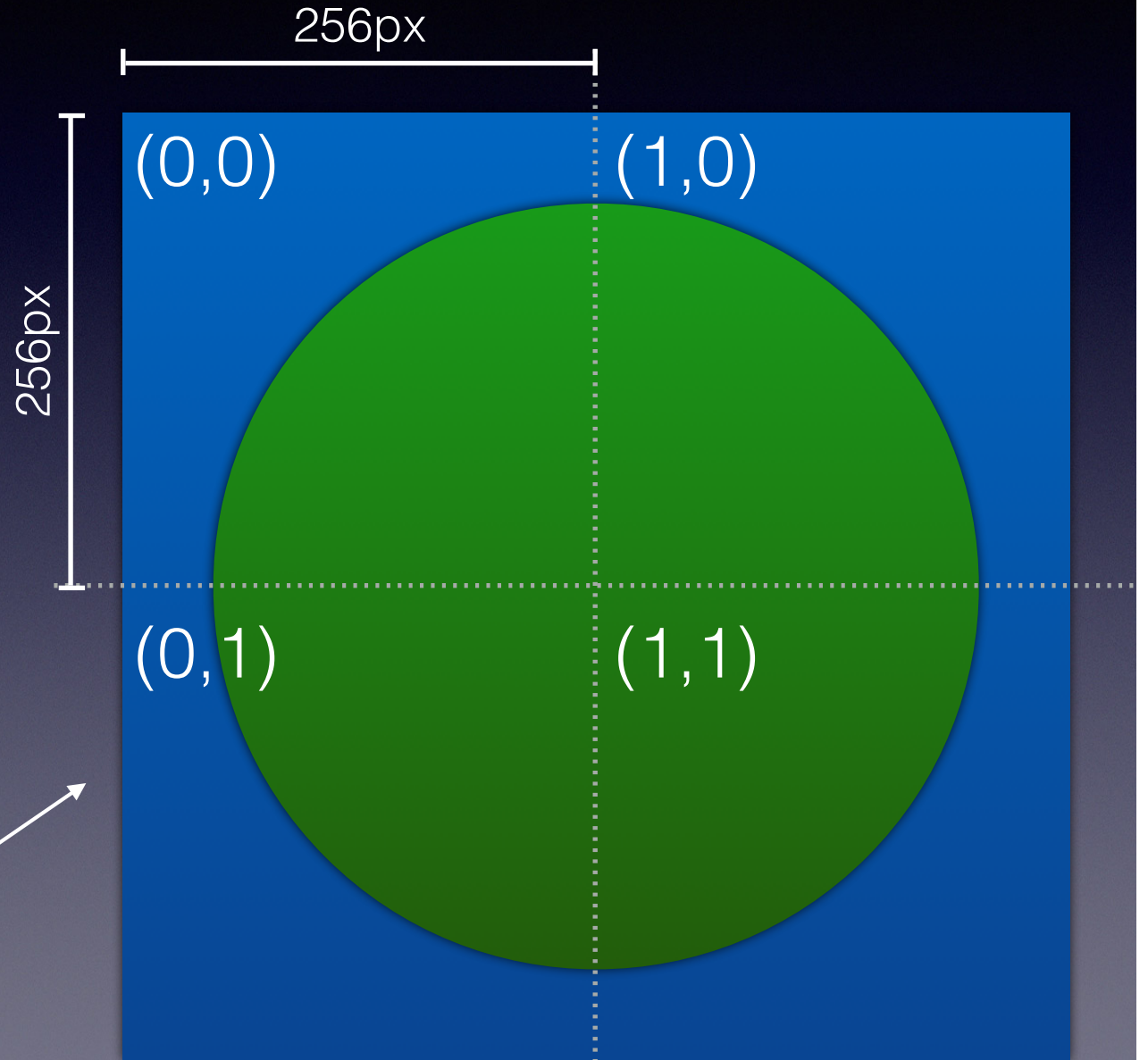


Zoom Level = 0



single tile

Zoom Level = 1

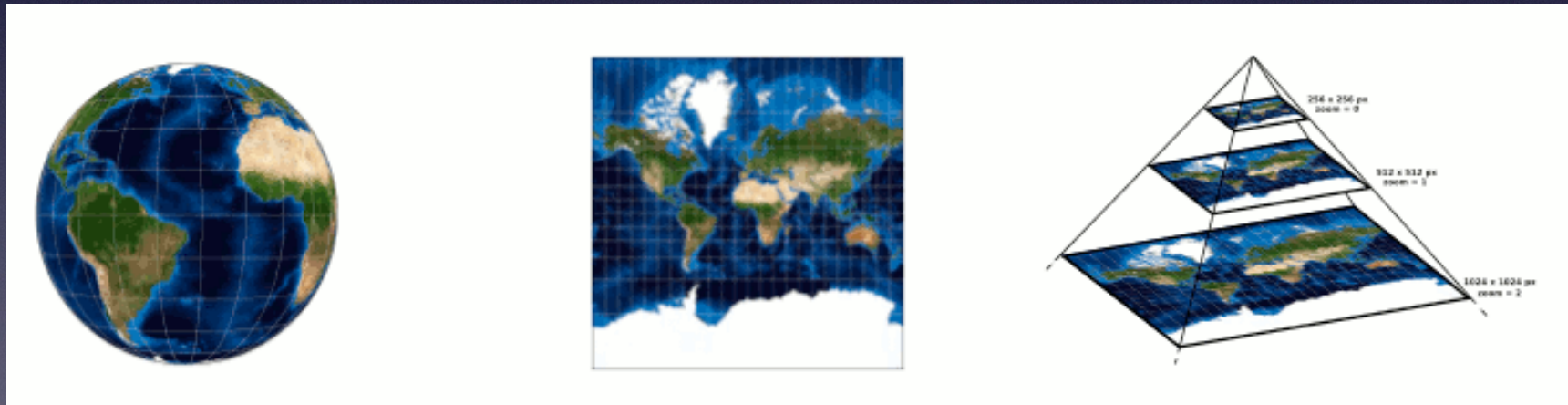


four tile

Problem with Tiles

- Earth = Sphere
- Tiles = Square

=> Mismatch



<http://www.maptiler.org/google-maps-coordinates-tile-bounds-projection/>

Enough about theory!

Let's talk about the
implementation!

Backend: Data Packaging

- Take OpenStreetMap XML Data (e.g.: 10 Mb)

- simplify features

- assign features to zoom-level/tile

- include features only once

- ➔ create JSON file (e.g.: 2.5 Mb)

- Convert JSON -> Binary format

- ➔ reduce file size (e.g. 0.4 Mb)

← e.g. don't include small streets when looking at entire Munich area

DEMO

Frontend: Storage

- Load `map.binary` from server using XHR2
- Load the data into IndexedDB
 - One entry per map
 - One entry per tile (x/y/z)

Frontend: Rendering

- Determine current tile $x/y/z$
- Render features one after the other
 - draw background features first (e.g. “Water”)
 - foreground features later (e.g. “Buildings”)
- ForEach: feature in sorted(SimplifiedFeatures)
 - look for tile in hierarchy that has data about feature
 - render all entries

Future Work

- Support labels
 - Street names, ...
- Highlight area with buildings
- Improve storage format
- Performance tuning

Why name it
“ptolemy”?

Thanks you!