# MBTiles: Anatomy of an Open File Format

Justin Miller
Development Seed / MapBox
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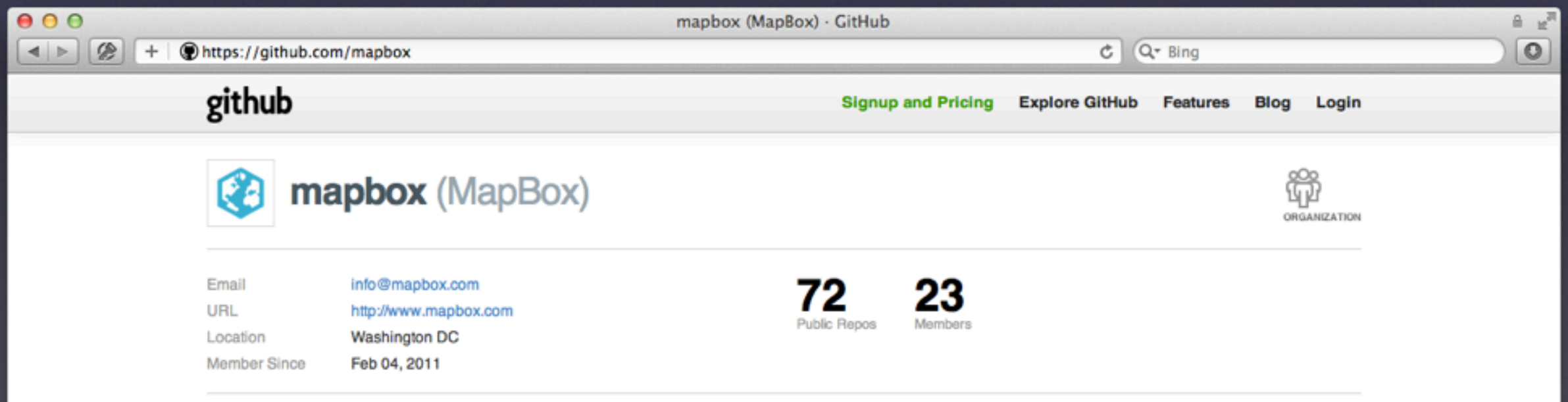
@incanus77

# Your Host

- Principally an iOS engineer these days
- Background in Mac, PHP/Drupal, sysadmin
- Open source software since about ’99

# MapBox

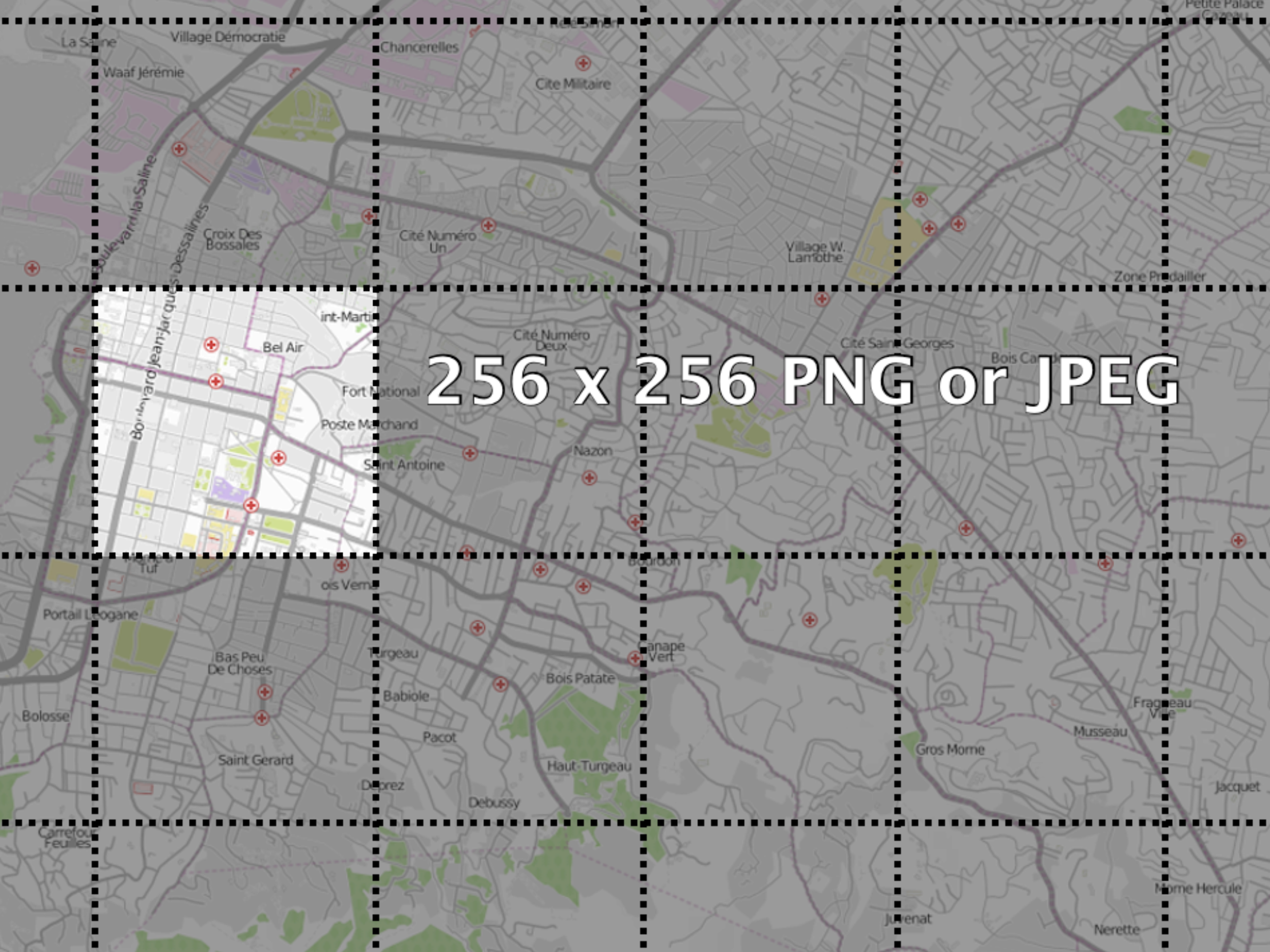
- Bootstrapped project of Development Seed
- Ecosystem around fast, beautiful maps
- Charge for cloud hosting (high availability)
- Produce lots of open source code



# Problem Background

- We work in “slippy maps”
- Maps are made up of tile images (256px)
- Maps have zoom levels

La Saline
Village Démocratie
Waaf Jérémie
Chancerelles
Rélé Simon
Cite Militaire
Petite Palace Cazeau
Boulevard la Saline
Croix Des Bossales
Cité Numéro Un
Village W. Lamothe
Zone Predaillier
int-Martin
Cité Numéro Deux
Bel Air
Cité Saint-Georges
Bois Caradeux
Fort National
Poste Marchand
Nazon
Saint Antoine
Morne a Tuf
ois Verna
Bourdon
Portail Leogane
Canape Vert
Turgeau
Bas Peu De Choses
Bois Patate
Babiole
Fragneau Ville
Bolosse
Pacot
Musseau
Saint Gerard
Gros Morne
Haut-Turgeau
Deprez
Debussy
Jacquet
Carrefour Feuilles
Morne Hercule
Juvenat
Nerette


256 x 256 PNG or JPEG
La Saline
Village Démocratie
Waaf Jérémie
Chancerelles
Cite Militaire
Boulevard la Saline
Croix Des Bossales
Cité Numéro Un
Village W. Lamothe
Zone Pradailler
Bel Air
Cité Numéro Deux
Cité Saint Georges
Fort National
Poste Marchand
Saint Antoine
Nazon
Bois Ca
Bourdon
Portail Lagane
Bas Peu De Choses
Turgeau
Canape Vert
Bois Patate
Babiole
Bolosse
Pacot
Saint Gerard
Haut-Turgeau
Gros Morne
Musseau
Jacquet
Debussy
Carrefour Feuilles
Morne Hercule
Nerette

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http://mapbox.com/maps/

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New York | (Tokyo) | Paris | London

portland, or

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Yakima

Vancouver

Portland

Salem

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Astoria
Kelso
Kalama
Seaside
Woodland
Saint Helens
Yacolt
Brush Prairie
Vancouver
Washougal
Hillsboro
Portland
Gresham
Aloha
Tillamook
Milwaukie
Tigard
Boring
Sherwood
Oregon City
Eagle Creek
Wilsonville
Newberg
Canby
McMinnville
Woodburn
Keizer
Lincoln City
Salem
Dallas

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Gresham
Forest Grove
Hillsboro
Portland
Beaverton
Milwaukie
Tigard
Lake Oswego
Clackamas
Boring
Tualatin
Gladstone
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Oregon City
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Wilsonville
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Canby
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Vancouver
Camas
Washougal
Troutdale
Gresham
Portland
Hillsboro
Cornelius
Aloha
Beaverton
Tigard
Milwaukie
Lake Oswego
Clackamas
Boring
Tualatin
Gladstone
Oregon City
Sherwood
Eagle Creek

I5 US 30 US 26 WA 500 WA 14 I205 OR 99E

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portland, or

Search

Smith and Bybee Wetlands Natural Area

Forest Park

Portland International Airport

Government Island State Recreation Area

Portland

Aloha

Beaverton

Milwaukie

US 30 | US 26 | I5 | I405 | OR 99E | OR 217 | WA 14 | I205

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portland, or | Search

PORTLAND

Willamette River

NE LOMBARD ST

NE PORTLAND HWY

NE SANDY BLVD

NE 82ND AVE

SE 82ND AVE

NE GRAND AVE

SW MACADAM AVE

SE FOSTER RD

NW CORNELL RD

SW CANYON RD

SW BEAVERTON HILLSDALE HWY

US 30 | US 26 | I5 | I405 | OR 99E

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New York (Tokyo) Paris London

portland, or Search

Albina
Irvington
Willamette Heights
Macleay Park
Kings Heights
The Pearl District
Lloyd District
Rose Quarter
Washington Park
PORTLAND
East Portland
Central East Side
Belmont
University District
Hoyt Arboretum
Portland Heights
Willamette River

US 30 US 26 I-5 I-405 OR 99E

NW NICOLAI ST NW VAUGHN ST NW CORNELL RD NW LOVEJOY ST NW GLISAN ST NW EVERETT ST W BURNSIDE ST W BURNSIDE RD SW ALDER ST SW MARKET ST SW 4TH AVE SW 3RD AVE NW 4TH AVE NE MARTIN LUTHER NE 15TH AVE NE 33RD AVE NE WEIDLER ST NORTHEAST BROADWAY NE GRAND AVE SE GRAND AVE NE COUCH ST E BURNSIDE ST SE MORRISON ST SE MADISON ST SE 11TH AVE SE 12TH AVE SE 20TH AVE T.H. BANFIELD FWY NE SANDY BLVD

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portland, or

Search

PORTLAND

THE PEARL DISTRICT

ROSE QUARTER

UNIVERSITY DISTRICT

EAST PORTLAND

CENTRAL EASTSIDE

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NW GLISAN ST · NW FLANDERS ST · NW EVERETT ST · NW DAVIS ST · NW COUCH ST · W BURNSIDE ST · SW ALDER ST · SW WASHINGTON ST · SW MORRISON ST · SW TAYLOR ST · SW SALMON ST · SW MAIN ST · SW MADISON ST · SW JEFFERSON ST · SW COLUMBIA ST · SW CLAY ST · SW MARKET ST · SW OAK ST · SW STARK ST · SW PINE ST · SW ASH ST · NW 3RD AVE · SW 3RD AVE · SW 4TH AVE · SW 2ND AVE · NW 2ND AVE · NW 4TH AVE · NW 8TH AVE · NW 9TH AVE · NW 11TH AVE · NW 12TH AVE · NW 13TH AVE · NW 14TH AVE · NW 15TH AVE · NW 16TH AVE · NW 17TH AVE · NW 18TH AVE · NW 19TH AVE · NW 20TH AVE · NW 20TH PL · NW 21ST AVE · NW TRINITY PL · STADIUM FWY · NORTHWEST BROADWAY · SOUTHWEST BROADWAY · SW PK AVE · SW 9TH AVE · SW 10TH AVE · SW 11TH AVE · SW 12TH AVE · SW 13TH AVE · SW 14TH AVE · SW 15TH AVE · SW 16TH AVE · SW 17TH AVE · SW 18TH AVE · SW 20TH AVE · SW 20TH PL · SW 21ST AVE · SW KING AVE · SW NAITO PKWY · SUNSET HWY · US 26 · JELD-WEN Field · Lincoln High School · Governor Tom McCall Waterfront Park

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portland, or | Search

SW ALDER ST | SW WASHINGTON ST | SW YAMHILL ST | SW TAYLOR ST | SW SALMON ST | SW MAIN ST | SW MORRISON ST | SW JEFFERSON ST | SW COLUMBIA ST | SW MADISON ST

SW 17TH AVE | SW 16TH AVE | SW 15TH AVE | SW 14TH AVE | SW 13TH AVE | SW 12TH AVE | SW 11TH AVE | SW 10TH AVE | SW 9TH AVE | SW 6TH AVE | SW 5TH AVE | SW 4TH AVE

SW PK AVE | SOUTHWEST BROADWAY | STADIUM FWY | I405

Lincoln High School | Portland Marriott | Smart Park | Oregon National Building | Meier & Frank Square | Portland Central Library | Nordstrom's | Portland Executive Tower | The Roosevelt | Mark Building | Eliot Tower | Portland Art Museum | United States Court House | Oregon Historical Society

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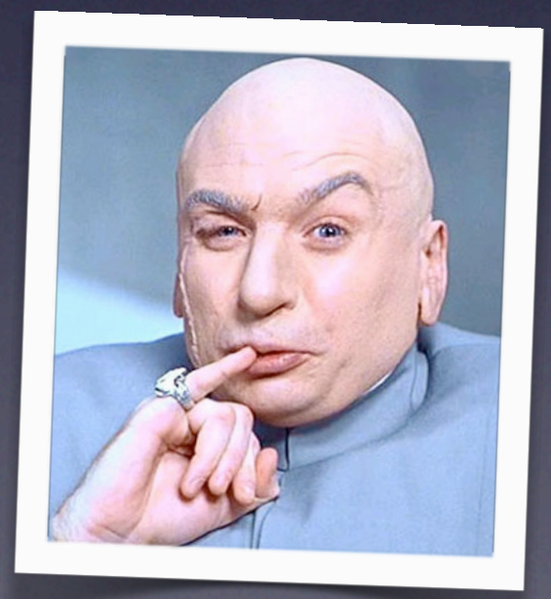
Terms & Feedback

# Map Tiles

- Can easily number in the millions
  - Zoom level 0
    - One 256x256 tile ($4^0$)
  - Zoom level 17
    - **17,179,869,184** tiles ($4^{17}$)



# Problem Space

- Many, many (many) files
- Transfer time (esp. network)
- Portability/cross-platform
- Data integrity


- SQLite: self-contained, cross-platform, server-less database
- *"Small. Fast. Reliable. Choose any three."*
- Had seen Dr. Hipp speak at a conference
- Did I mention it's cross-platform?

# Enter MBTiles

- Put tile images in rows as binary blobs
- Index by slippy tile `z/x/y`
- Add a metadata table
- That's about it


http://www.flickr.com/photos/mutantlog/21436957

geography-class.mbtiles

Schema | Data | SQL | Log

TABLES
- grid_key
- grid_utfgrid
- images
- keymap
- map
- metadata
- sqlite_master

VIEWS
- grid_data
- grids
- tiles

OPTIONS
- main

| Name | Type |
|---|---|
| zoom_level | INTEGER |
| tile_column | INTEGER |
| tile_row | INTEGER |
| tile_data | blob |

```
CREATE VIEW tiles AS
    SELECT
        map.zoom_level AS zoom_level,
        map.tile_column AS tile_column,
        map.tile_row AS tile_row,
        images.tile_data AS tile_data
    FROM map
    JOIN images ON images.tile_id = map.tile_id
```

geography-class.mbtiles

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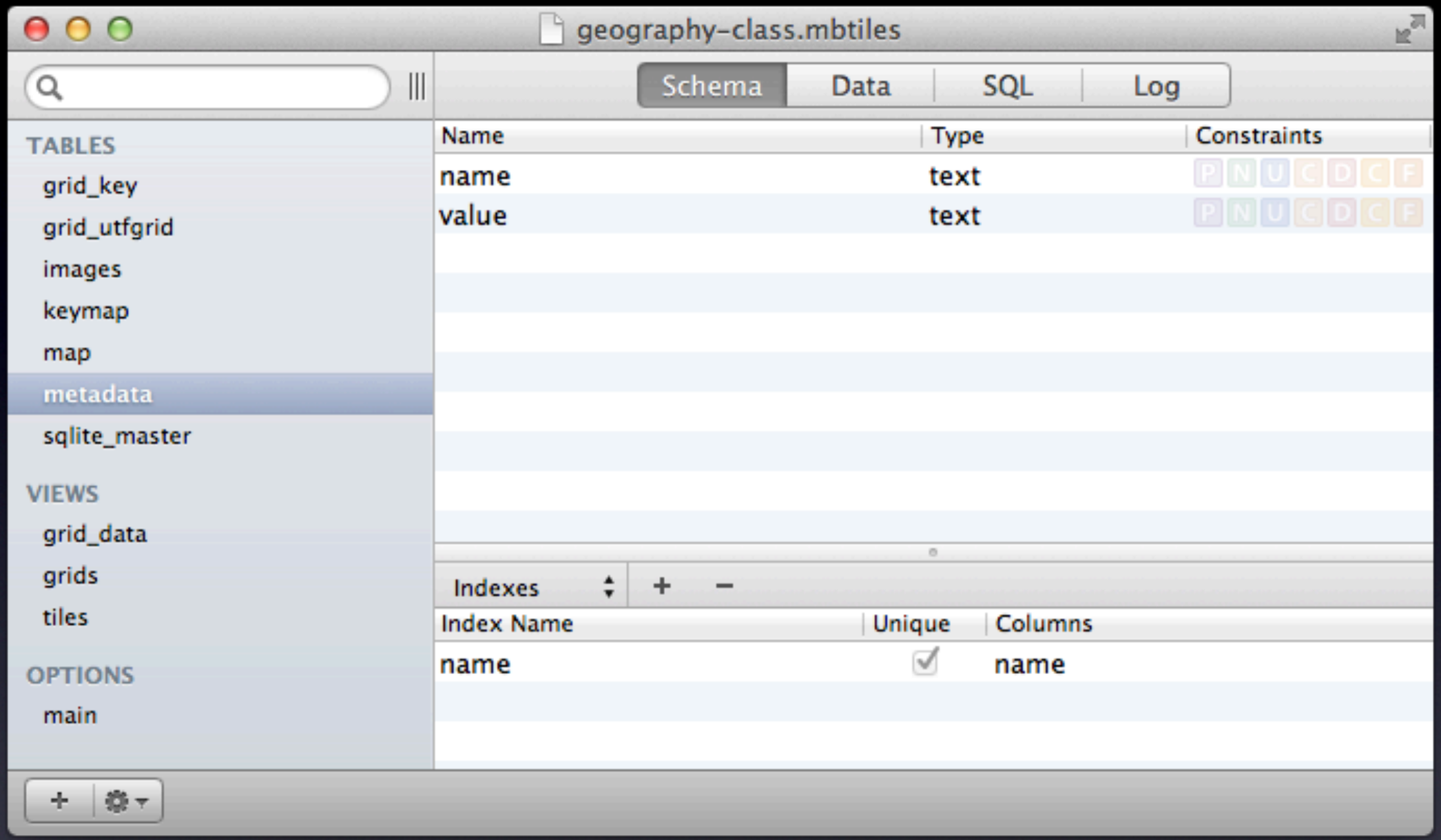
VIEWS
- grid_data
- grids
- tiles

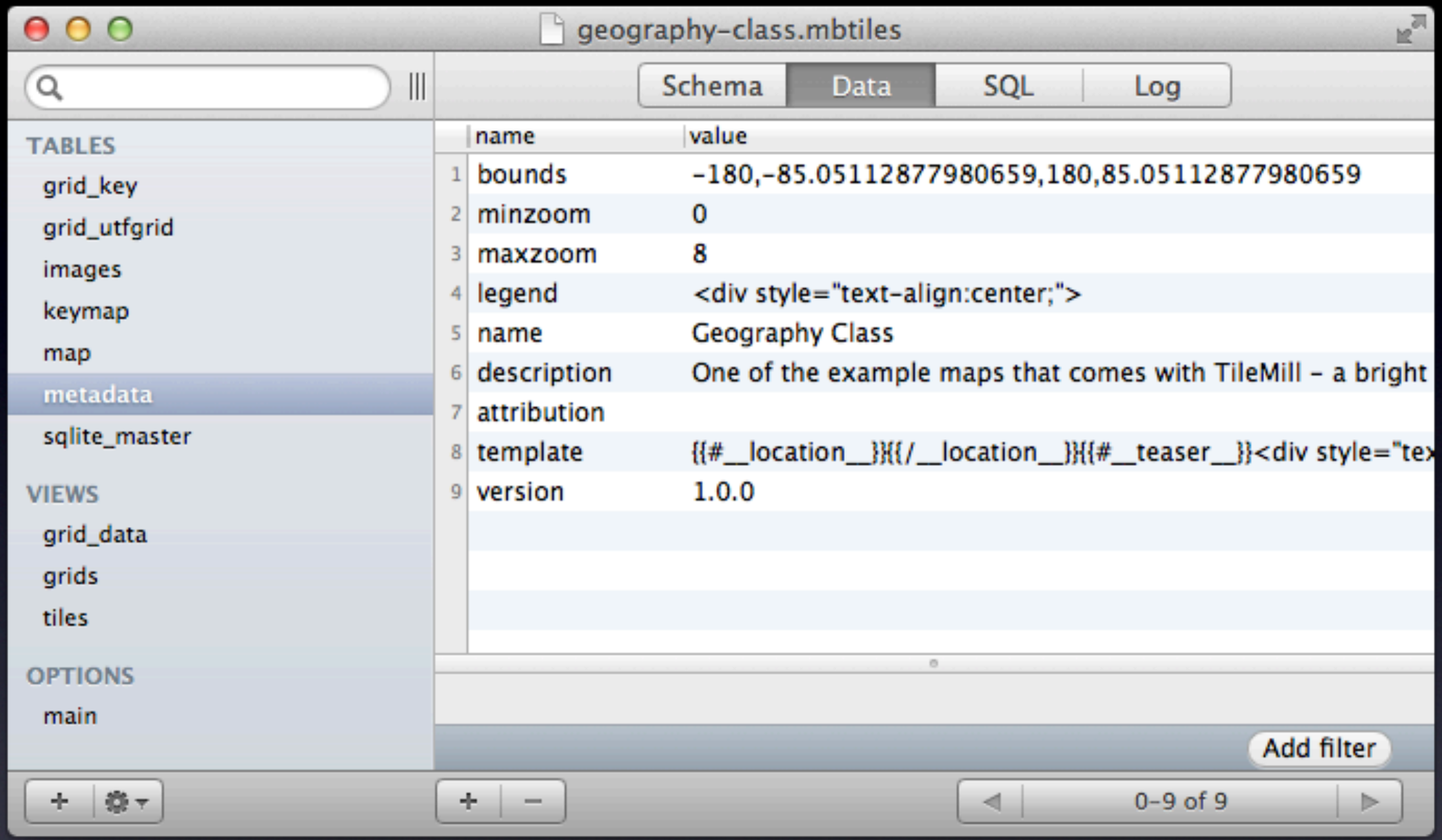
OPTIONS
- main

| | zoom_level | tile_column | tile_row | tile_data |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | |
| 2 | 1 | 0 | 0 | |
| 3 | 1 | 0 | 1 | |
| 4 | 1 | 1 | 0 | |
| 5 | 1 | 1 | 1 | |
| 6 | 2 | 0 | 0 | |
| 7 | 2 | 0 | 1 | |
| 8 | 2 | 0 | 2 | |
| 9 | 2 | 0 | 3 | |
| 10 | 2 | 1 | 0 | |
| 11 | 2 | 1 | 1 | |
| 12 | 2 | 1 | 2 | |
| 13 | 2 | 1 | 3 | |

Add filter

0–100 of 87381


geography-class.mbtiles
Schema
Data
SQL
Log
TABLES
grid_key
grid_utfgrid
images
keymap
map
metadata
sqlite_master
VIEWS
grid_data
grids
tiles
OPTIONS
main
Name
Type
Constraints
name
text
value
text
Indexes
Index Name
Unique
Columns
name
name


geography-class.mbtiles
Schema
Data
SQL
Log
TABLES
grid_key
grid_utfgrid
images
keymap
map
metadata
sqlite_master
VIEWS
grid_data
grids
tiles
OPTIONS
main
name
value
1 bounds -180,-85.05112877980659,180,85.05112877980659
2 minzoom 0
3 maxzoom 8
4 legend 
5 name Geography Class
6 description One of the example maps that comes with TileMill - a bright
7 attribution
8 template {{#__location__}}{{/__location__}}{{#__teaser__}}<div style="tex
9 version 1.0.0
Add filter
0-9 of 9

# Extra Goodies

- Compression
  - 3GB → 1GB → 300MB
- Batch operations (move, delete, transfer)
- Offline use & ease of packaging
- Checksumming/integrity
- De-duping & views

geography-class.mbtiles

Schema | Data | SQL | Log

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- map
- metadata
- sqlite_master

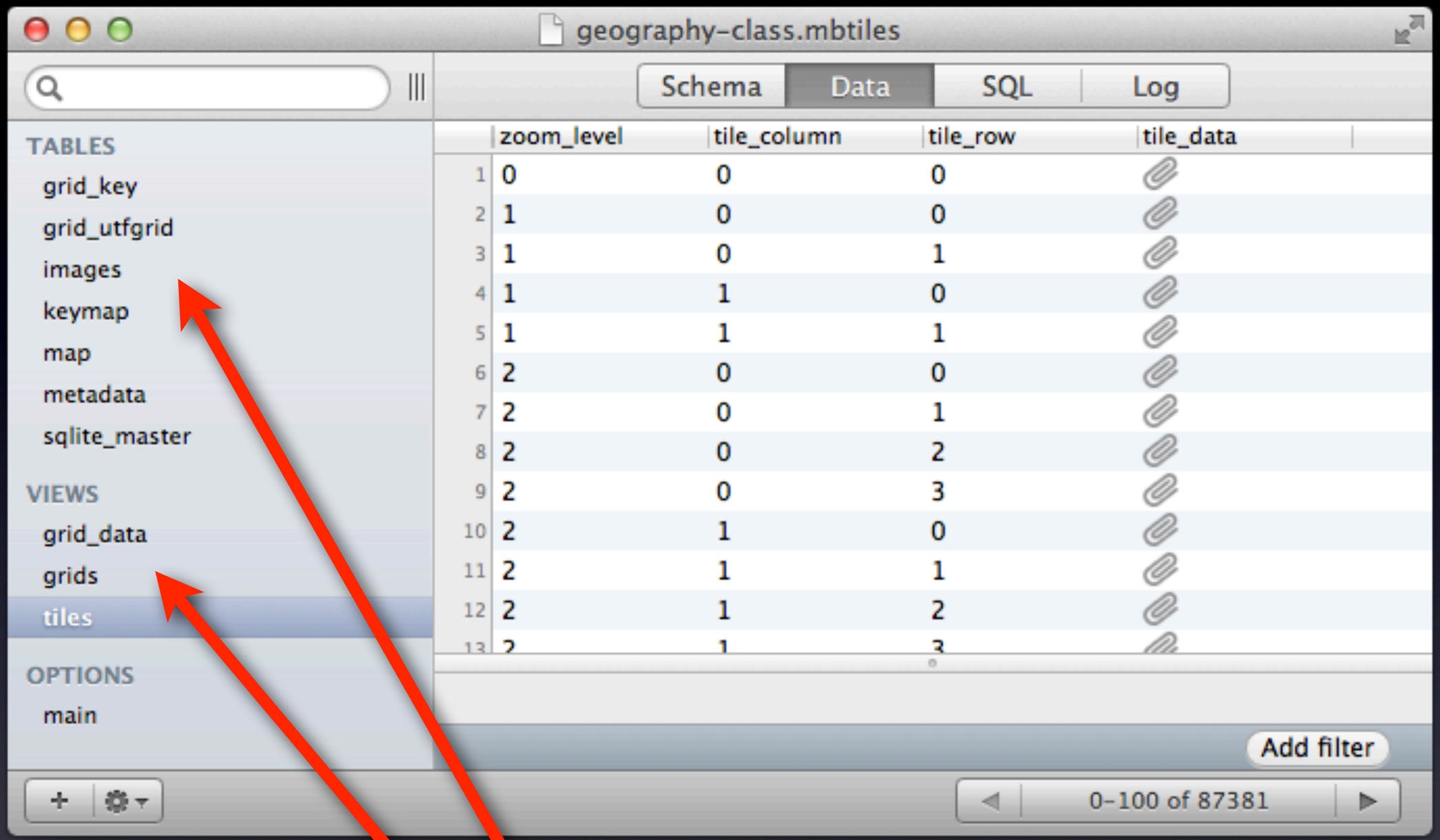
VIEWS
- grid_data
- grids
- tiles

OPTIONS
- main

| | zoom_level | tile_column | tile_row | tile_data |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | |
| 2 | 1 | 0 | 0 | |
| 3 | 1 | 0 | 1 | |
| 4 | 1 | 1 | 0 | |
| 5 | 1 | 1 | 1 | |
| 6 | 2 | 0 | 0 | |
| 7 | 2 | 0 | 1 | |
| 8 | 2 | 0 | 2 | |
| 9 | 2 | 0 | 3 | |
| 10 | 2 | 1 | 0 | |
| 11 | 2 | 1 | 1 | |
| 12 | 2 | 1 | 2 | |
| 13 | 2 | 1 | 3 | |

Add filter

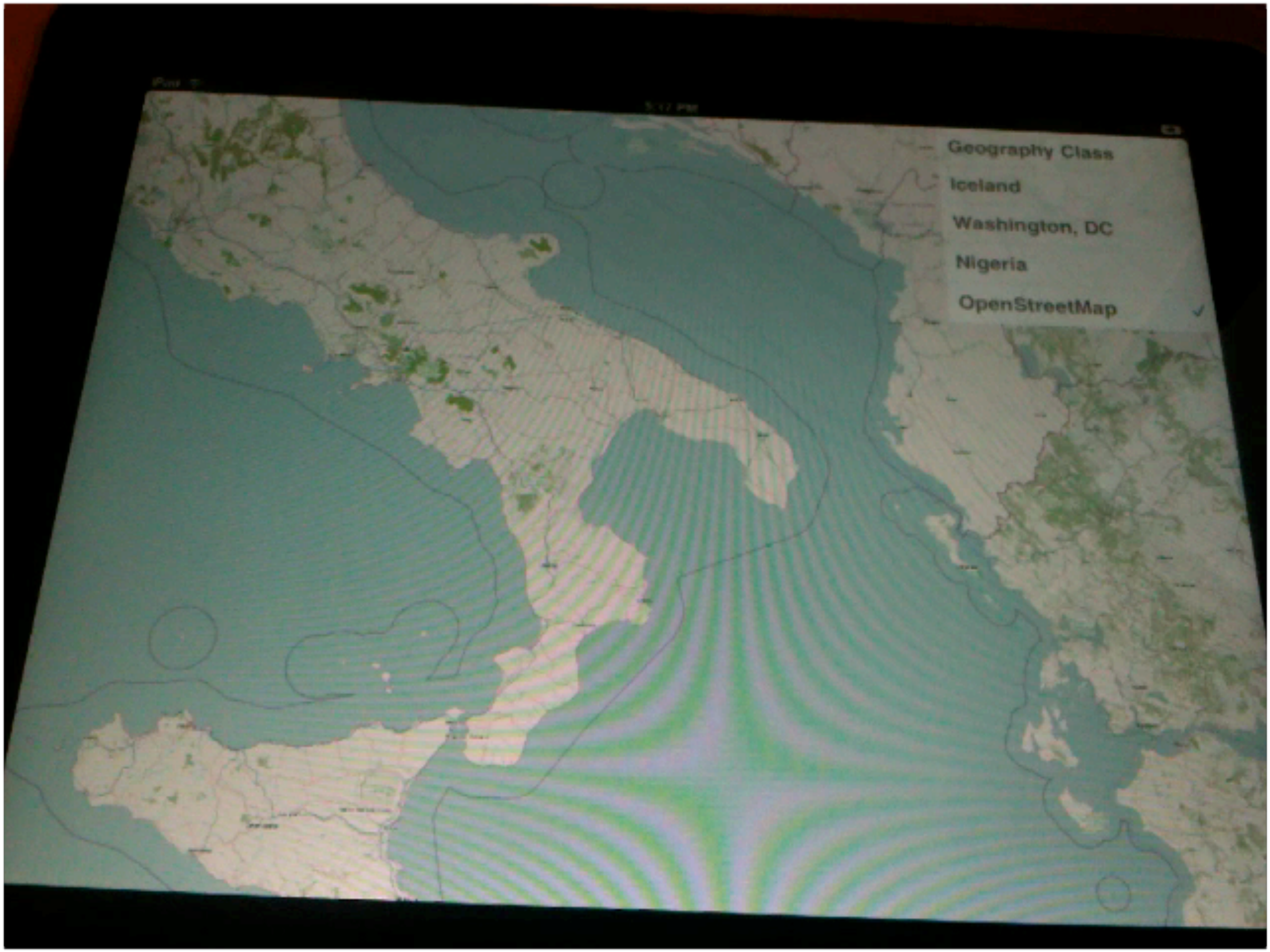
0–100 of 87381




Views: kind of like aliases

# Unrelated SQLite Stuff

- R*Tree
- SpatiaLite
- Don’t needlessly complicate


Geography Class
Iceland
Washington, DC
Nigeria
OpenStreetMap

TileMill

Editor
Projects
Manual
Plugins
Settings

ZOOM 3

DS Team

Save | Export

style.mss

```
// from http://www.colourlovers.com/palette/522000/Storming_Psychedeli

@water: #3B2D38;
@land: #BCBDAC;
@fill: #F27435;
@border: darken(@land, 5.0);

Map {
  background-color: @water;
}

#countries {
  polygon-fill: @land;
  line-color: @border;
  line-width: 0.1;
}

#countries {
  [NAME = "Germany"],
  [NAME = "South Africa"],
  [NAME = "Peru"] {
    polygon-fill: @fill;
    line-color: @border;
    line-width: 0.1;
  }
}

#states [ISO = "USA"] {
  line-width: 0.1;
  [NAME_1 = "District of Columbia"],
  [NAME_1 = "Oregon"],
  [NAME_1 = "Washington"],
  [NAME_1 = "Minnesota"] {
    polygon-fill: @fill;
    line-color: @border;
  }
}
```

TileMill

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ZOOM 3

DS Team

Save | Export | Upload | PNG | PDF | SVG | MBTiles | Mapnik XML | View exports

style.mss

```
// from http://www.colourlovers.com/palette/522000
@water: #3B2D38;
@land: #BCBDAC;
@fill: #F27435;
@border: darken(@land, 5.0);

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  line-width: 0.1;
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#countries {
  [NAME = "Germany"],
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  [NAME = "Peru"] {
    polygon-fill: @fill;
    line-color: @border;
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  }
}

#states [ISO = "USA"] {
  line-width: 0.1;
  [NAME_1 = "District of Columbia"],
  [NAME_1 = "Oregon"],
  [NAME_1 = "Washington"],
  [NAME_1 = "Minnesota"] {
    polygon-fill: @fill;
    line-color: @border;
  }
}
```

TileMill

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View exports

ds_team.mbtiles
Started Jun 27 10:25am — 00:00:19s
00:04:36s remaining

chocolate_map.mbtiles
Started Mar 5 10:04pm — 00:00:06s
Save

ctoutage.png
Started Jan 18 10:18am — 00:00:01s
Save

demo.mbtiles
Started Oct 18 06:30pm — 00:13:25s
Save

DS Team

Save Export

style.mss

```
1  // from http://www.colourlovers.com/palette/522000/Storming_Psychedeli
2
3  @water: #3B2D38;
4  @land: #BCBDAC;
5  @fill: #F27435;
6  @border: darken(@land, 5.0);
7
8  Map {
9    background-color: @water;
10 }
11
12 #countries {
13   polygon-fill: @land;
14   line-color: @border;
15   line-width: 0.1;
16 }
17
18 #countries {
19   [NAME = "Germany"],
20   [NAME = "South Africa"],
21   [NAME = "Peru"] {
22     polygon-fill: @fill;
23     line-color: @border;
24     line-width: 0.1;
25   }
26 }
27
28 #states [ISO = "USA"] {
29   line-width: 0.1;
30   [NAME_1 = "District of Columbia"],
31   [NAME_1 = "Oregon"],
32   [NAME_1 = "Washington"],
33   [NAME_1 = "Minnesota"] {
34     polygon-fill: @fill;
35     line-color: @border;
36   }
37 }
```

Travel Map | MapBox

https://tiles.mapbox.com/justin/map/travel

MapBox, LLC

Bing

MapBox

Justin Miller | Logout

Map details ON

SHARE +

Countries Michelle & I have visited

Info | Stats

Embed | Saved | Download | Delete

# Travel Map

From Justin Miller — Feb 22 2012

Zoom 0 to 6

Bounds Global

Map showing countries Michelle and I have been to.

Center 0.000 0.000 3

lat lon zoom

- [x] Zoom
- [x] Legend
- [x] Scroll zoom
- [x] Tooltips
- [x] Share links
- [ ] BW detection

**Privacy**

- (•) Public Visible to everyone
- ( ) Hidden Visible if you know the URL

Travel Map | MapBox

https://tiles.mapbox.com/justin/map/travel

MapBox, LLC

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SHARE +

Info | Stats

Embed | Saved | Download | Delete

## Download

Download a copy of the original uploaded file.

Download MBTiles

travel.mbtiles (11.1 MB)

## Travel Map

From Justin Miller — Feb 22 2012

Zoom 0 to 6

Bounds Global

Map showing countries Michelle and I have been to.

Center 0.000 0.000 3

lat lon zoom

Zoom
Tooltips
Legend
Share links
Scroll zoom
BW detection

Privacy

Public Visible to everyone

Hidden Visible if you know the URL

Countries Michelle & I have visited

geography-class-mini.mbtiles Info

**geography-class-mini.mbtiles** 30.7 MB
Modified: Friday, April 6, 2012 2:51 PM

▶ **Spotlight Comments:**

▶ General:

▼ More Info:

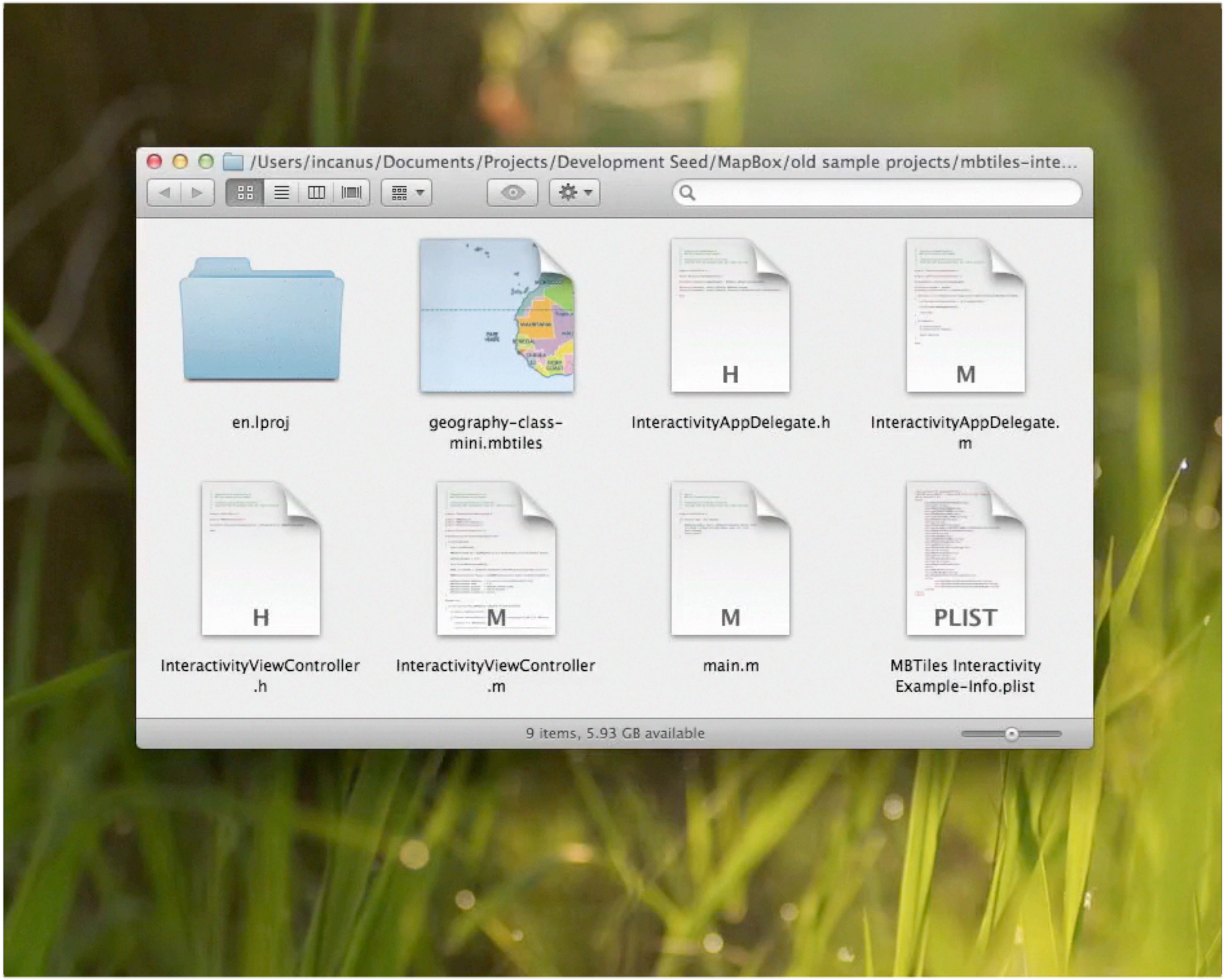
Display name: Geography Class
Description: One of the example maps that comes with TileMill - a bright & colorful world map that blends retro and high-tech with its folded paper texture and interactive flag tooltips.
Kind: MBTiles

▶ Name & Extension:

▶ Open with:

▼ Preview:

▶ Sharing & Permissions:


/Users/incanus/Documents/Projects/Development Seed/MapBox/old sample projects/mbtiles-inte...
en.lproj
geography-class-mini.mbtiles
H
InteractivityAppDelegate.h
M
InteractivityAppDelegate.m
H
InteractivityViewController.h
M
InteractivityViewController.m
M
main.m
PLIST
MBTiles Interactivity Example-Info.plist
9 items, 5.93 GB available

# GDAL – Geospatial Data Abstraction Library

**Select language**: [English][Russian][Portuguese][French/Francais]

GDAL is a translator library for raster geospatial data formats that is released under an X/MIT style Open Source license by the Open Source Geospatial Foundation. As a library, it presents a single abstract data model to the calling application for all supported formats. It also comes with a variety of useful commandline utilities for data translation and processing. The NEWS page describes the May 2012 GDAL/OGR 1.9.1 release.

The related OGR library (which lives within the GDAL source tree) provides a similar capability for simple features vector data.

Master: http://www.gdal.org
Download: ftp at remotesensing.org, http at download.osgeo.org

## User Oriented Documentation

- Wiki – Various user and developer contributed documentation and hints
- Downloads – Ready to use binaries (executables)
- Supported Formats : GeoTIFF, Erdas Imagine, SDTS, ECW, MrSID, JPEG2000, DTED, NITF, ...
- GDAL Utility Programs : gdalinfo, gdal_translate, gdaladdo, gdalwarp, ...
- GDAL FAQ
- GDAL Data Model
- GDAL/OGR Governance and Community Participation
- GDAL Service Provider Listings (not vetted)
- Sponsors, Acknowledgements and Credits
- Software Using GDAL

## Developer Oriented Documentation

- Building GDAL From Source
- Downloads – source code
- API Reference Documentation
- GDAL API Tutorial
- GDAL Driver Implementation Tutorial
- GDAL Warp API Tutorial
- OGRSpatialReference Tutorial
- GDAL C API
- GDAL Algorithms C API
- GDALDataset C++ API
- GDALRasterBand C++ API
- GDAL for Windows CE

## Mailing List

A gdal-announce mailing list subscription is a low volume way of keeping track of major developments with the GDAL/OGR project.

The gdal-dev@lists.osgeo.org mailing list can be used for discussion of development and user issues related to GDAL and related technologies. Subscriptions can be done, and archives reviewed on the web. The mailing list is also available in read-only format by NNTP at news://news.gmane.org/gmane.comp.gis.gdal.devel and by HTTP at http://news.gmane.org/gmane.comp.gis.gdal.devel. Archives since 2005 are searchable on Nabble.

Some GDAL/OGR users and developers can also often be found in the gdal IRC channel on irc.freenode.net.

## Bug Reporting

GDAL bugs can be reported, and can be listed using Trac.

## GDAL In Other Languages

GDAL: GDAL – Geospatial Data Abstraction Library

http://gdal.org/

MBTiles

http://gdal.org/frmt_mbtiles.html

Bing

# MBTiles

Starting with GDAL 2.0, the MBTiles driver allows to read rasters in the MBTiles format, which is a specification for storing tiled map data in SQLite databases.

GDAL/OGR must be compiled with OGR SQLite driver support, and JPEG and PNG drivers.

The SRS is always the Pseudo-Mercator (a.k.a Google Mercator) projection.

The driver can retrieve pixel attributes encoded according to the UTFGrid specification available in some MBTiles files. They can be obtained with the gdallocationinfo utility, or with a GetMetadataItem("Pixel_iCol_iLine", "LocationInfo") call on a band object.

## Examples:

- Accessing a remote MBTiles raster :

```
$ gdalinfo /vsicurl/http://a.tiles.mapbox.com/v3/kkaefer.iceland.mbtiles
```

Output:

```
Driver: MBTiles/MBTiles
Files: /vsicurl/http://a.tiles.mapbox.com/v3/kkaefer.iceland.mbtiles
Size is 16384, 16384
Coordinate System is:
PROJCS["WGS 84 / Pseudo-Mercator",
    GEOGCS["WGS 84",
        DATUM["WGS_1984",
            SPHEROID["WGS 84",6378137,298.257223563,
                AUTHORITY["EPSG","7030"]],
            AUTHORITY["EPSG","6326"]],
        PRIMEM["Greenwich",0,
            AUTHORITY["EPSG","8901"]],
        UNIT["degree",0.0174532925199433,
            AUTHORITY["EPSG","9122"]],
        AUTHORITY["EPSG","4326"]],
    PROJECTION["Mercator_1SP"],
    PARAMETER["central_meridian",0],
    PARAMETER["scale_factor",1],
    PARAMETER["false_easting",0],
    PARAMETER["false_northing",0],
    UNIT["metre",1,
        AUTHORITY["EPSG","9001"]],
    AXIS["X",EAST],
    AXIS["Y",NORTH],
    EXTENSION["PROJ4","+proj=merc +a=6378137 +b=6378137 +lat_ts=0.0 +lon_0=0.0 +x_0=0.0 +y_0=0 +k=1.0 +units=m +nadgrids=@null +wktext  +no_defs"],
    AUTHORITY["EPSG","3857"]]
Origin = (-3757031.250000000000000,11271093.750000000000000)
Pixel Size = (152.873992919921875,-152.873992919921875)
Image Structure Metadata:
  INTERLEAVE=PIXEL
Corner Coordinates:
Upper Left  (-3757031.250,11271093.750) ( 33d44'59.95"W, 70d36'45.36"N)
Lower Left  (-3757031.250, 8766406.250) ( 33d44'59.95"W, 61d36'22.97"N)
Upper Right (-1252343.750,11271093.750) ( 11d14'59.98"W, 70d36'45.36"N)
Lower Right (-1252343.750, 8766406.250) ( 11d14'59.98"W, 61d36'22.97"N)
```

TileStache

http://tilestache.org/

Reader

Bing

***TileStache* is a Python-based server application that can serve up map tiles based on rendered geographic data.**

You might be familiar with TileCache, the venerable open source WMS server from MetaCarta. TileStache is similar, but we hope simpler and better-suited to the needs of designers and cartographers.

**Read more** about the motivations behind TileStache in an introductory blog post.

**Get TileStache:** on GitHub, from PyPI via `easy_install`, and as a direct download here. Modest Maps (Github, PyPI, download) is required to use TileStache.

See also documentation, and ask for help in the Tilestache group.


Mustaches: IMG_7531 by locaburg, on Flickr.

## Features

Things TileStache does now:

- Renders Mapnik maps.
- Serves pre-rendered tiles out of MBTiles tilesets.
- Generates vector tiles from OGR datasources in GeoJSON usable in Polymaps.
- Caches to disk, Memcache, Amazon S3, MBTiles, and elsewhere.
- Serves tiles in Google-style spherical mercator projection and WGS84 lat/lon projection.

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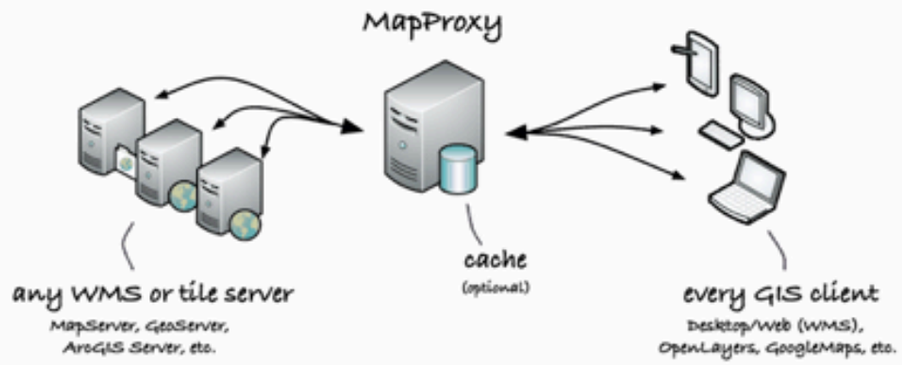
# MapProxy



## About

MapProxy is an open source proxy for geospatial data. It caches, accelerates and transforms data from existing map services and serves any desktop or web GIS client.




MapProxy is a tile cache solution, but also offers many new and innovative features like full support for WMS clients.

MapProxy is actively developed and supported by Omniscale, it is released under the Apache Software License 2.0, runs on Unix/Linux and Windows and is easy to install and to configure.

## News

- **2012-05-15**: New MapProxy 1.4.0 release
- **2012-01-13**: New MapProxy 1.3.0 release
- **2011-08-31**: New MapProxy 1.2.0 release
- **2011-06-26**: New MapProxy 1.1.1 release
- **2011-05-31**: New MapProxy 1.1.0 release

## Features of MapProxy

### Tile cache

MapProxy is a tile server (WMS-C, TMS, WMTS, KML SuperOverlays).

It reads data from:

- WMS sources (1.0.0–1.3.0)
- TMS/WMTS sources
- Mapserver and Mapnik configurations
- any TileCache, Google Maps or Bing compatible source

Other features:

- cache data on filesystem, as MBTiles or inside CouchDB
- reproject WMS sources to other SRS
- stores identical images just once (e.g. ocean tiles)

MapProxy — The accelerating web map proxy.

http://mapproxy.org/

Bing

# MapProxy

Home | Documentation | Download | Development | Support | Blog

## About

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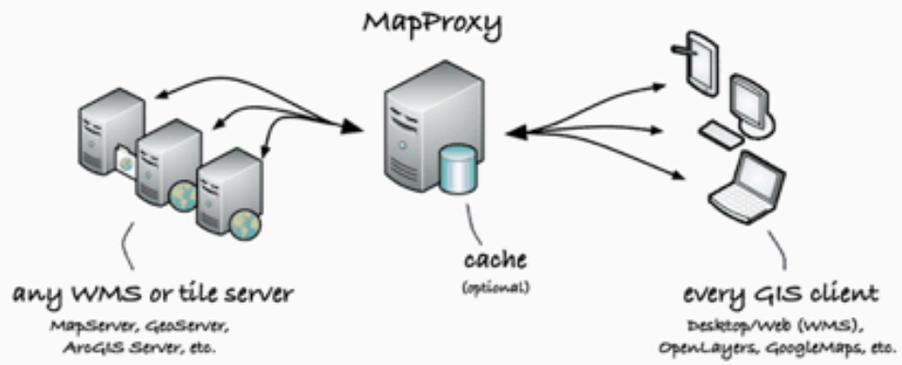


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Arc2Earth | Publish your GIS data instantly to the Cloud

http://www.arc2earth.com/

Bing

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Help & Support

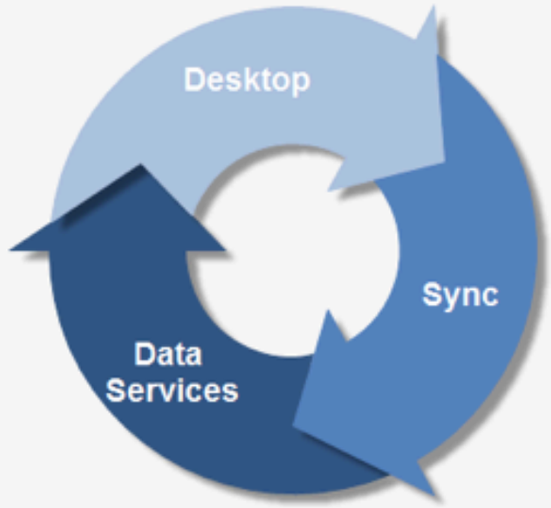
# Tools and Services for ArcGIS

Desktop KML and Tile Cache Creation

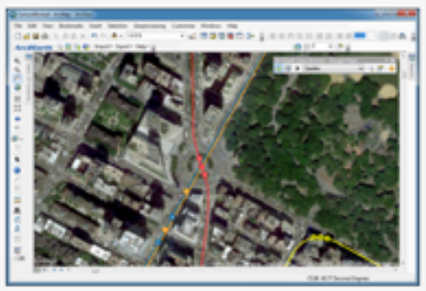
View Google Maps directly in ArcGIS

Synchronize your ArcGIS data with multiple Cloud providers

Learn More




Overview Arc2Earth Desktop Arc2Earth Data Services Arc2Earth Sync



## New Version of Data Services

You asked for it and we listened. Printing, exporting, layout view, multiple projections and more! New monthly subscriptions also let you get started for just $49/month! Check out the all new Data Services

## Arc2Earth Sync Public Beta

Try out Sync for your ArcGIS data. Update Fusion Tables, Earth Builder or CartoDB from ArcMap, ArcGIS.com support tool

## NEWS FROM THE BLOG

- Arc2Earth Sync – Live Mobile Data Collection in 5 Minutes
- Table Sharing in Arc2Earth Sync
- New Provider Model and CartoDB Provider for Sync

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RT @NLTMarketing: New Blog Post - Arc2Earth Has a New Product Called Sync by William

LocalGovernmentInfrastructureBasemap.mxd - ArcMap - ArcView

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1:9,243

Arc2Earth Import Export Help Satellite

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Hibiscus Ave

Kentucky Ave

S 8th St

S 9th St

S 11th St

S 7th St

S 10th St

S 12th St

Beach Ct

Parkway Dr

Drawing Arial

## Map Tile Exporter

General | Levels | Storage | Viewers

**Map Levels**

Start Level: 13

End Level: 19

Create Tiles

Export Map at Full Extent

Cache Format

Google Maps (z/x/y)

- Google Maps (z/x/y)
- MS Bing Quadkey (0123)
- ArcGIS Server (Level/Row/Column)
- WeoGeo (z/y/x)
- OSGEO Tile Map Service (z/y/x)
- MBTiles - SQLite DB

Advanced Options...

**Map Scales for Levels**

Level 13 Map Scale = 1: 72,224 (1 tiles)
Level 14 Map Scale = 1: 36,112 (1 tiles)
Level 15 Map Scale = 1: 18,056 (2 tiles)
Level 16 Map Scale = 1: 9,028 (6 tiles)
Level 17 Map Scale = 1: 4,514 (28 tiles)
Level 18 Map Scale = 1: 2,257 (112 tiles)
Level 19 Map Scale = 1: 1,128 (432 tiles)

Total Tiles: 582

Create Group Layers for these Levels in your Document. Each Group Layer will have Min and Max Scale dependencies that are appropriate for the level.

Add a copy of your layers to each Group

Create

Options... Export... Close

LocalGovernmentInfrastructureBasemap.mxd - ArcMap - ArcView

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

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djcoin/MBTilesDroidSpitter

https://github.com/djcoin/MBTilesDroidSpitter

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Android librairy for reading MBtiles map format (sqlite based) — Read more

Clone in Mac | ZIP | HTTP | Git Read-Only | https://github.com/djcoin/MBTilesDroidSpitter.g | Read-Only access

branch: master | Files | Commits | Branches 1 | Tags | Downloads

Latest commit to the **master** branch

Reformatted readme.rst

djcoin authored a year ago — commit 9c57c248db

## MBTilesDroidSpitter /

| name | age | message | history |
|---|---|---|---|
| res | a year ago | Initial commit [djcoin] | |
| src | a year ago | Added readme and author [djcoin] | |
| .classpath | a year ago | Initial commit [djcoin] | |
| .gitignore | a year ago | Initial commit [djcoin] | |
| .project | a year ago | Initial commit [djcoin] | |
| AndroidManifest.xml | a year ago | Initial commit [djcoin] | |
| CHANGELOG.rst | a year ago | Initial commit [djcoin] | |
| README.rst | a year ago | Reformatted readme.rst [djcoin] | |
| TODO.rst | a year ago | Initial commit [djcoin] | |
| default.properties | a year ago | Initial commit [djcoin] | |
| proguard.cfg | a year ago | Initial commit [djcoin] | |

# Android Mapping API SDK

Android Mapping API SDK has a free Google Maps package component. Nutiteq Mobile Mapping library has many extra features, compared to Google:

- Many extra map sources built-in: OpenStreetMap, CloudMade, Navteq/MapTP, DigitalGlobe aerial, BLOM aerial, Bing/Microsoft and Yahoo maps. Google has only Google maps and satellite.
- **Own map services** can be used using WMS, TMS, Ka-Map or even own custom API-s
- Support for **offline (stored and bundled) maps**
- Draw **lines and polygons** on map in addition to point markers. Google enables only points.
- Use online or offline **KML data** as overlays
- Raster overlays (e.g. for traffic data)
- **Routing** service
- Geocoding service
- API compatibility with other Mobile Java platforms: Nutiteq SDK works also on Java ME (J2ME) and BlackBerry (both Midlet and CLDC API)
- No limitations on application types. Google does not allow some application types, and requires expensive enterprise licenses for e.g. asset tracking / fleet management applications

To get started with Android mapping, take a look to our Android Mapping Tutorial.

For Advanced uses see sample mapping application project https://bitbucket.org/nutiteq/android-map-samples . It shows many general Maps lib features, and some specific tricks in Android: how to show route instructions, how to implement Search with Android API, even SpatiaLite and Proj.4 NDK integrations etc. You can also download pre-compiled Nutiteq SDK demo app to your phone from Android Market.



## Map API

Nutiteq Maps Lib SDK enables developing advanced mobile mapping applications.
Platforms: Android, RIM BlackBerry, Java ME (J2ME)
Download maps API SDK »

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- Fleet Management Solutions
- Interactive Guide
- Customized Maps
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Last at *Tue, 3 Apr 2012 23:31:42*
Topic: **MapXT SDK evaluation**
See more news »

Android Mapping API SDK | Nutiteq

New BlackBerry sample app | Nutiteq

http://www.nutiteq.com/new-blackberry-sample-app

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# New BlackBerry sample app

You can find now from BitBucket sources of RIM BlackBerry Mapping SDK sample which shows some basic Nutiteq mapping features on BlackBerry SDK 7 (should work also on 5.0 and up):

- online mapping
- offline mapping with MGM files
- offline mapping with MBTiles database
- Show UTFGrid tooltips from MBTiles database
- Routing with CloudMade service
- Switching online and offline mode of app

We'll try to publish it as ready-built app in BlackBerry World store, it is in their review now.

Get started on BlackBerry mapping with Nutiteq Mapping SDK now.

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Search

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Home » Blogs » jaak's blog

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Last at *Tue, 3 Apr 2012 23:31:42*

Topic: **MapXT SDK evaluation**

See more news »

# Ecosystem Support

- Open specification/easy URL (mbtiles.org)
- Language implementations (JS, ObjC)
- Utility tools (`mbutil` etc.)
- First class OS support (e.g. Mac plugins)
- Implementations list (wiki)

mapbox/mbtiles-spec

https://github.com/mapbox/mbtiles-spec

github Search... Explore Gist Blog Help incanus

PUBLIC mapbox / mbtiles-spec

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specification documents for the MBTiles tileset format — Read more
http://mbtiles.org/

Clone in Mac | ZIP | HTTP | SSH | Git Read-Only | git@github.com:mapbox/mbtiles-spec.git | Read+Write access

branch: master | Files | Commits | Branches 2 | Tags | Downloads

Latest commit to the master branch

Reformat Implementations link

tmcw authored a month ago commit 5afa38ead7

mbtiles-spec /

| name | age | message | history |
|---|---|---|---|
| 1.0 | a year ago | Updating 1.0 [Tom MacWright] | |
| 1.1 | 10 months ago | Line-breaking 1.1 spec, expanding README [tmcw] | |
| 1.2 | 7 months ago | Add link to utfgrid-spec. [willwhite] | |
| README.md | a month ago | Reformat Implementations link [tmcw] | |

README.md

# MBTiles Specification

MBTiles is a specification for storing tiled map data in SQLite databases for immediate usage and for transfer. MBTiles files, known as **tilesets**, must implement the specification below to ensure compatibility with devices.

## mbtiles-spec / 1.1

| name | age | message | history |
|---|---|---|---|
| .. | | | |
| demo.json | a year ago | add demo file to test implementations [kkaefer] | |
| interaction.md | a year ago | Add interaction.md, remove formatter.md [yhahn] | |
| spec.md | 10 months ago | Line-breaking 1.1 spec, expanding README [tmcw] | |
| utfgrid.md | a year ago | clarify codepoint ranges [kkaefer] | |

# MBTiles 1.1

## Sub-sections:

- **Interaction**: HTTP endpoints needed for implementing interactivity
- **UTFGrid**: storage of data used for interactivity

## Abstract

MBTiles is a specification for storing tiled map data in SQLite databases for immediate usage and for transfer. MBTiles files, known as **tilesets**, must implement the specification below to ensure compatibility with devices.

## Database Specifications

Tilesets are expected to be valid SQLite databases of version 3.0.0 or higher. Only core SQLite features are permitted; tilesets **cannot require extensions**.

## Database

# Implementations

New Page Edit Page Page History

## 1.1 Compliant

- MapBox Hosting
- TileStream
- MapBox iOS SDK (example)
- GDAL
- python: raster2mb (write)
- python: mbutil (read/write)
- python: landez (read/write) (uses mbutil)
- python: TileStache (code) (read/write) - a full, high-quality tile server
- python: TileCloud
- Arc2Earth (write)
- python: mapproxy (announcement) (read/write)

## Others

- python/Django: django-mbtiles
- objc: MapDBImporter (write)
- java/android: MBTilesDroidSpitter (example) (read)
- objc/iPhone: Maptual (read)
- java/Android: Locus (read)
- Windows compatible viewer: MBTilesViewer (read)
- java/Android: Nutiteq SDK
- Python: MBTiles-Extractor
- Java/Processing: Unfolding (read) (example)

# Applications

- MapBox for iPad (read)
- js: TileMill (write)
- TileMill OS X QuickLook & Spotlight plugins (read)

RMMapBoxSource.m

```objc
- (NSURL *)URLForTile:(RMTile)tile
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = tile.y;

    if ([self.infoDictionary objectForKey:@"scheme"] && [[self.infoDictionary objectForKey:@"scheme"] isEqual:@"tms"])
        y = pow(2, zoom) - tile.y - 1;

    NSString *tileURLString = [self.infoDictionary objectForKey:@"tileURL"];

    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{z}" withString:[[NSNumber numberWithInteger:zoom] stringValue]];
    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{x}" withString:[[NSNumber numberWithInteger:x]    stringValue]];
    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{y}" withString:[[NSNumber numberWithInteger:y]    stringValue]];

    return [NSURL URLWithString:tileURLString];
}
```

Line: 1 Column: 1 Objective-C Soft Tabs: 4 Symbol

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Line: 3 Column: 1 Objective-C Soft Tabs: 4 Symbol

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    return [NSURL URLWithString:tileURLString];
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```

Line: 7 Column: 1 Objective-C Soft Tabs: 4 Symbol

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    NSInteger x    = tile.x;
    NSInteger y    = tile.y;

    if ([self.infoDictionary objectForKey:@"scheme"] && [[self.infoDictionary objectForKey:@"scheme"] isEqual:@"tms"])
        y = pow(2, zoom) - tile.y - 1;

    NSString *tileURLString = [self.infoDictionary objectForKey:@"tileURL"];

    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{z}" withString:[[NSNumber numberWithInteger:zoom] stringValue]];
    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{x}" withString:[[NSNumber numberWithInteger:x]    stringValue]];
    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{y}" withString:[[NSNumber numberWithInteger:y]    stringValue]];

    return [NSURL URLWithString:tileURLString];
}
```

Line: 10 Column: 1 Objective-C Soft Tabs: 4 Symbol

RMMapBoxSource.m

```objc
- (NSURL *)URLForTile:(RMTile)tile
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = tile.y;

    if ([self.infoDictionary objectForKey:@"scheme"] && [[self.infoDictionary objectForKey:@"scheme"] isEqual:@"tms"])
        y = pow(2, zoom) - tile.y - 1;

    NSString *tileURLString = [self.infoDictionary objectForKey:@"tileURL"];

    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{z}" withString:[[NSNumber numberWithInteger:zoom] stringValue]];
    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{x}" withString:[[NSNumber numberWithInteger:x]    stringValue]];
    tileURLString = [tileURLString stringByReplacingOccurrencesOfString:@"{y}" withString:[[NSNumber numberWithInteger:y]    stringValue]];

    return [NSURL URLWithString:tileURLString];
}
```

Line: 16 Column: 1 Objective-C Soft Tabs: 4 Symbol

RMMBTilesSource.m

```objc
- (UIImage *)imageForTile:(RMTile)tile inCache:(RMTileCache *)tileCache
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = pow(2, zoom) - tile.y - 1;

    __block UIImage *image;

    [queue inDatabase:^(FMDatabase *db)
    {
        FMResultSet *results = [db executeQuery:@"select tile_data from tiles where zoom_level = ? and tile_column = ? and tile_row = ?",
                                [NSNumber numberWithShort:zoom],
                                [NSNumber numberWithUnsignedInt:x],
                                [NSNumber numberWithUnsignedInt:y]];

        if ([db hadError])
            image = [RMTileImage errorTile];

        [results next];

        NSData *data = [results dataForColumn:@"tile_data"];

        if ( ! data)
            image = [RMTileImage errorTile];
        else
            image = [UIImage imageWithData:data];

        [results close];
    }];

    return image;
}
```

Line: 1 Column: 1 Objective-C Soft Tabs: 4 Symbol

RMMBTilesSource.m

```objc
- (UIImage *)imageForTile:(RMTile)tile inCache:(RMTileCache *)tileCache
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = pow(2, zoom) - tile.y - 1;

    __block UIImage *image;

    [queue inDatabase:^(FMDatabase *db)
    {
        FMResultSet *results = [db executeQuery:@"select tile_data from tiles where zoom_level = ? and tile_column = ? and tile_row = ?",
                                [NSNumber numberWithShort:zoom],
                                [NSNumber numberWithUnsignedInt:x],
                                [NSNumber numberWithUnsignedInt:y]];

        if ([db hadError])
            image = [RMTileImage errorTile];

        [results next];

        NSData *data = [results dataForColumn:@"tile_data"];

        if ( ! data)
            image = [RMTileImage errorTile];
        else
            image = [UIImage imageWithData:data];

        [results close];
    }];

    return image;
}
```

Line: 3 Column: 1 Objective-C Soft Tabs: 4 Symbol

RMMBTilesSource.m

```objc
- (UIImage *)imageForTile:(RMTile)tile inCache:(RMTileCache *)tileCache
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = pow(2, zoom) - tile.y - 1;

    __block UIImage *image;

    [queue inDatabase:^(FMDatabase *db)
    {
        FMResultSet *results = [db executeQuery:@"select tile_data from tiles where zoom_level = ? and tile_column = ? and tile_row = ?",
                                [NSNumber numberWithShort:zoom],
                                [NSNumber numberWithUnsignedInt:x],
                                [NSNumber numberWithUnsignedInt:y]];

        if ([db hadError])
            image = [RMTileImage errorTile];

        [results next];

        NSData *data = [results dataForColumn:@"tile_data"];

        if ( ! data)
            image = [RMTileImage errorTile];
        else
            image = [UIImage imageWithData:data];

        [results close];
    }];

    return image;
}
```

Line: 11 Column: 1 Objective-C Soft Tabs: 4 Symbol

RMMBTilesSource.m

```objc
- (UIImage *)imageForTile:(RMTile)tile inCache:(RMTileCache *)tileCache
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = pow(2, zoom) - tile.y - 1;

    __block UIImage *image;

    [queue inDatabase:^(FMDatabase *db)
    {
        FMResultSet *results = [db executeQuery:@"select tile_data from tiles where zoom_level = ? and tile_column = ? and tile_row = ?",
                                [NSNumber numberWithShort:zoom],
                                [NSNumber numberWithUnsignedInt:x],
                                [NSNumber numberWithUnsignedInt:y]];

        if ([db hadError])
            image = [RMTileImage errorTile];

        [results next];

        NSData *data = [results dataForColumn:@"tile_data"];

        if ( ! data)
            image = [RMTileImage errorTile];
        else
            image = [UIImage imageWithData:data];

        [results close];
    }];

    return image;
}
```

Line: 26 Column: 1 Objective-C Soft Tabs: 4 Symbol

RMMBTilesSource.m

```objc
- (UIImage *)imageForTile:(RMTile)tile inCache:(RMTileCache *)tileCache
{
    NSInteger zoom = tile.zoom;
    NSInteger x    = tile.x;
    NSInteger y    = pow(2, zoom) - tile.y - 1;

    __block UIImage *image;

    [queue inDatabase:^(FMDatabase *db)
    {
        FMResultSet *results = [db executeQuery:@"select tile_data from tiles where zoom_level = ? and tile_column = ? and tile_row = ?",
                                [NSNumber numberWithShort:zoom],
                                [NSNumber numberWithUnsignedInt:x],
                                [NSNumber numberWithUnsignedInt:y]];

        if ([db hadError])
            image = [RMTileImage errorTile];

        [results next];

        NSData *data = [results dataForColumn:@"tile_data"];

        if ( ! data)
            image = [RMTileImage errorTile];
        else
            image = [UIImage imageWithData:data];

        [results close];
    }];

    return image;
}
```

Line: 31 Column: 1 Objective-C Soft Tabs: 4 Symbol

# Takeaways

- Think outside your comfort zone
- Open formats win
- Prepare to be surprised
- Communicate

# Thank You!

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