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Web Mapping with MySQL

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Agenda

1. Make web maps ubiquitous
2. Make MySQL ubiquitous
3. ???
4. PROFIT!!!

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3. **Use MySQL as a backend for web maps**
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I'm in Brussels for FOSDEM.

Where can I find a place that serves beer?

L

Any Linux distro will do

Ubuntu 14.04 LTS

A

Whichever Apache version came with my OS

M

MySQL 5.7.5 DMR from repo.mysql.com

Sveta's JSON UDFs

P

Whichever PHP version came with my OS

MySQL 5.7.5 DMR

- GeoJSON functions
  - ST_AsGeoJSON()
  - ST_GeomFromGeoJSON()
- InnoDB R-tree indexes
- Geohash functions
  - ST_PointFromGeohash()
  - ST_AsGeohash()
  - …
- Starting to replace homegrown GIS algorithms with Boost.Geometry
- Lots of other features and improvements

Database

```
CREATE TABLE bars
(
    id BIGINT PRIMARY KEY,
    position POINT NOT NULL,
    name VARCHAR(100) CHARSET utf8mb4,
    SPATIAL INDEX (position)
) ENGINE=InnoDB;
```

- Using the set of Belgian bars, pubs and cafés from OSM

OpenLayers

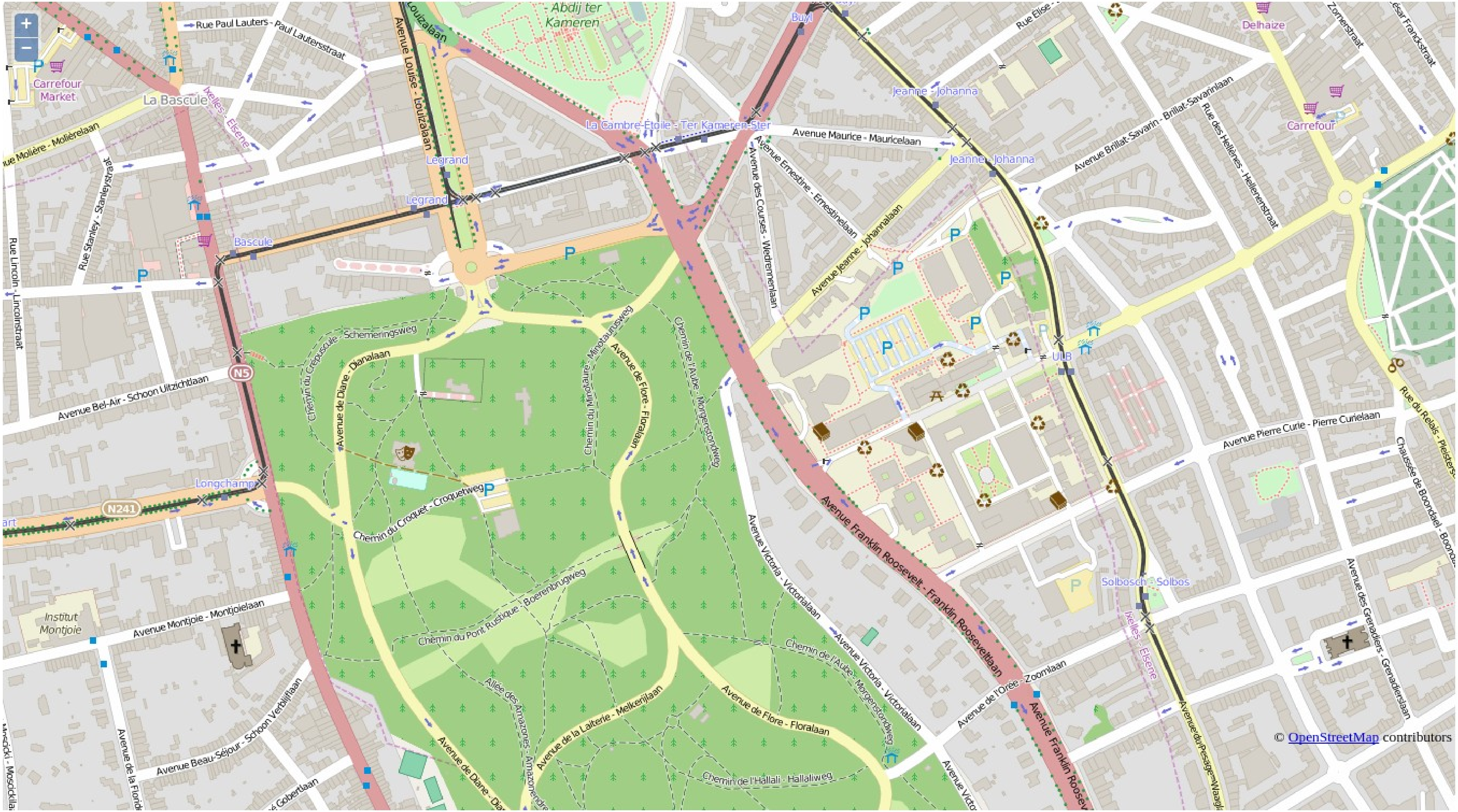
- Simple setup following an online guide

  http://docs.openlayers.org/library/introduction.html

  Modifications:

  – OpenStreetMap map layer
    - More detailed than the default in the guide
  – Local tile cache since I might be offline when I present this

```
<html><head><title>OpenLayers Example</title>
<script src="openlayers/OpenLayers.js"></script>
</head>
<body>
 <div style="width:100%; height:100%" id="map"></div>
 <script defer="defer" type="text/javascript">
  var map = new OpenLayers.Map('map');
  var osm_url = "http://localhost:8080/map/tiles.php?z=${z}&x={x}&y=${y}&r=mapnik"
  var osm = new OpenLayers.Layer.OSM('osm', [osm_url]);
 map.addLayer(osm);
 map.zoomToMaxExtent();
</script></body></html>
```


Abdij ter Kameren
Rue Paul Lauters - Paul Lautersstraat
Avenue Louise - Louizalaan
Carrefour Market
La Bascule
Ixelles - Elsene
Rue Molière - Molièrelaan
Rue Stanley - Stanleystraat
Rue Lincoln - Lincolnstraat
Legrand
Bascule
La Cambre-Etoile - Ter Kameren-Ster
Avenue Maurice - Mauricelaan
Avenue Ernestine - Ernestinelaan
Avenue des Courses - Wedrennenlaan
Avenue Jeanne - Johannalaan
Jeanne - Johanna
Buyl
Rue Elise
Delhaize
Carrefour
Avenue Brillat-Savarin - Brillat-Savarinlaan
Rue des Hellènes - Hellenenstraat
Zomerstraat
N5
N241
Avenue Bel-Air - Schoon Uitzichtlaan
Longchamp
Chemin du Crépuscule - Schemeringsweg
Avenue de Diane - Dianalaan
Chemin du Minotaure - Minotaurusweg
Avenue de Flore - Floralaan
Chemin de l'Aube - Morgenstondweg
Chemin du Croquet - Croquetweg
ULB
Avenue Pierre Curie - Pierre Curielaan
Rue du Relais - Pleisterstraat
Chaussée de Boondael - Boondaalsesteenweg
Avenue Franklin Roosevelt - Franklin Rooseveltlaan
Avenue Victoria - Victorialaan
Solbosch - Solbos
Institut Montjoie
Avenue Montjoie - Montjoielaan
Chemin du Pont Rustique - Boerenbrugweg
Allée des Amazones - Amazonendreef
Avenue de la Laiterie - Melkerijlaan
Avenue de Flore - Floralaan
Chemin de l'Aube - Morgenstondweg
Chemin de l'Hallali - Hallaliweg
Avenue de l'Orée - Zoomlaan
Avenue des Grenadiers - Grenadierslaan
Avenue du Pesage - Waaglaan
Avenue Beau-Séjour - Schoon Verblijflaan
Avenue de la Floride
Avenue de Diane - Dianalaan
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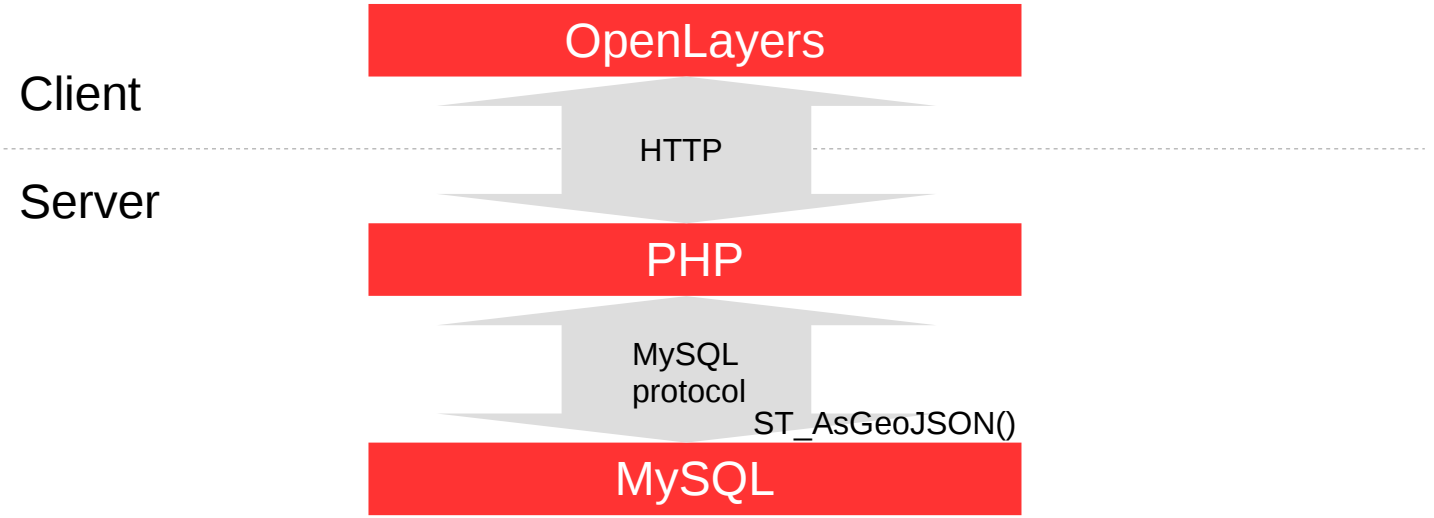
Connecting the parts

- Both MySQL 5.7.5 and OpenLayers support GeoJSON
- Use a PHP script to query the database



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    "http://localhost:8080/map/tiles.php?z=${z}&x=
                                {x}&y=${y}&r=mapnik"
  var osm = new OpenLayers.Layer.OSM('osm',
                                        [osm_url]);

  var geojson_format = new
                       OpenLayers.Format.GeoJSON();
```

```
var bar_layer = new
 OpenLayers.Layer.Vector("Bars",
 {
  strategies: [new
                   OpenLayers.Strategy.BBOX()],
  protocol: new OpenLayers.Protocol.HTTP(
   {
    url: 'bars.php',
    format: geojson_format
   })
 });
```

```
map.addLayers([osm, bar_layer]);
map.zoomToMaxExtent();
</script></body></html>
```

GeoJSON

```
{
    "type":"FeatureCollection",
    "features":
    [
        {
            "type":"Feature",
            "geometry":{"type":"Point","coordinates":[4.3055838,51.2289849]},
            "properties": {"name":"Smoutput"}
        },
        {
            "type":"Feature",
            "geometry": {"type":"Point","coordinates":[4.7008868,50.8774354]},
            "properties": {"name":"Thomas Stapleton"}
        }
    ]
}
```

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}
```

One row of the table

GeoJSON

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            "properties": {"name":"Thomas Stapleton"}
        }
    ]
}
```

ST_AsGeoJSON(*position*)

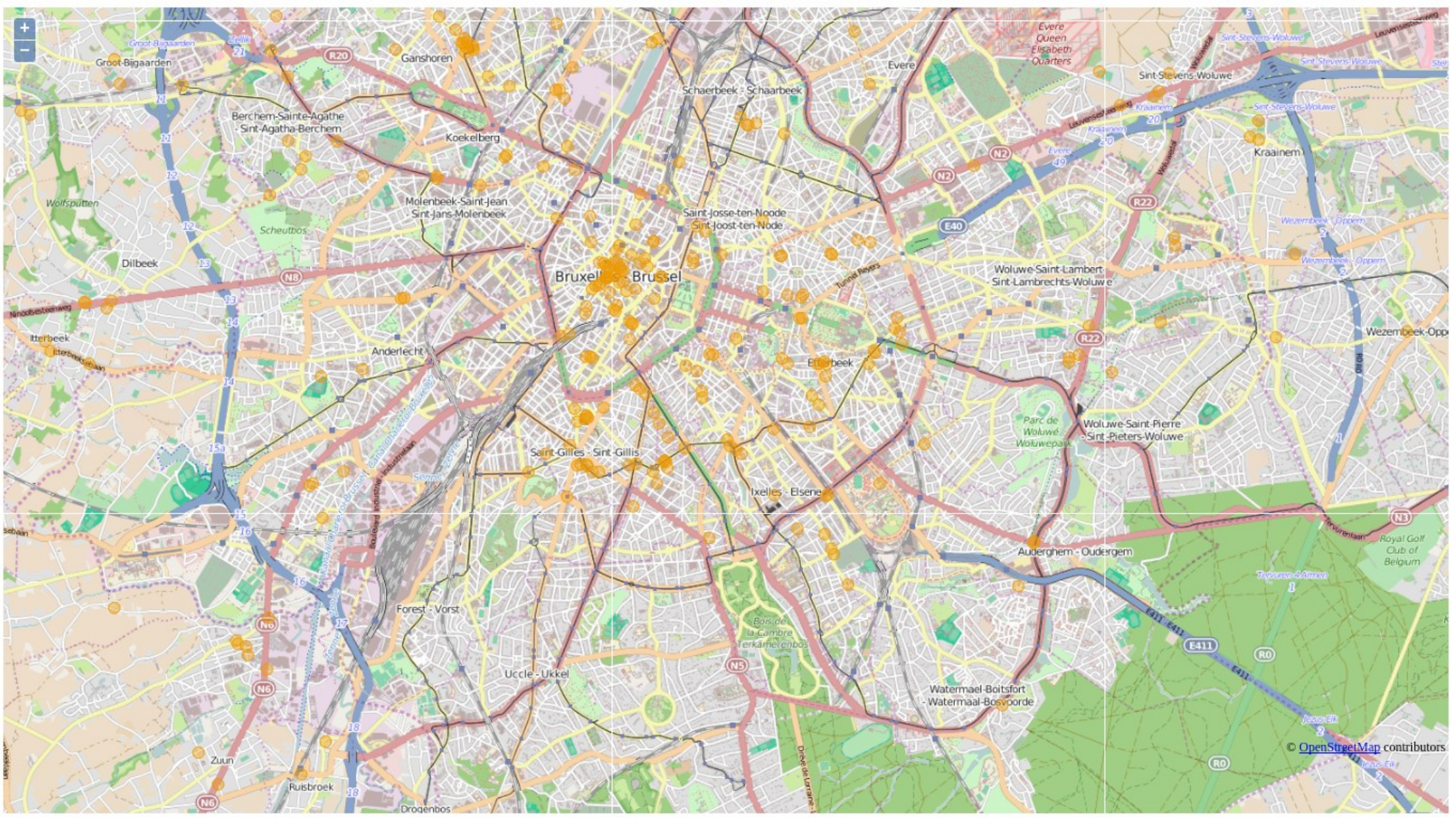
JSON_APPEND()

JSON_APPEND(*object*, *attribute_name*, *value*);

```
SELECT JSON_APPEND('{}', 'foo', '"bar"');
{"foo": "bar"}
```

Query

```
SELECT JSON_APPEND
(
   JSON_APPEND('{"type":"Feature"}', 'geometry', ST_AsGeoJSON(position)),
   'properties',
   JSON_APPEND('{}', 'name', CONCAT('"', name, '"'))
) AS json
FROM bars;
```


Groot-Bijgaarden
Ganshoren
Evere
Schaerbeek - Schaarbeek
Sint-Stevens-Woluwe
Berchem-Sainte-Agathe - Sint-Agatha-Berchem
Koekelberg
Kraainem
Wolfsputten
Scheutbos
Molenbeek-Saint-Jean - Sint-Jans-Molenbeek
Saint-Josse-ten-Noode - Sint-Joost-ten-Node
Dilbeek
Bruxelles - Brussel
Woluwe-Saint-Lambert - Sint-Lambrechts-Woluwe
Itterbeek
Anderlecht
Etterbeek
Wezembeek-Oppem
Woluwe-Saint-Pierre - Sint-Pieters-Woluwe
Parc de Woluwé - Woluwepark
Saint-Gilles - Sint-Gillis
Ixelles - Elsene
Auderghem - Oudergem
Royal Golf Club of Belgium
Forest - Vorst
Uccle - Ukkel
Watermael-Boitsfort - Watermaal-Bosvoorde
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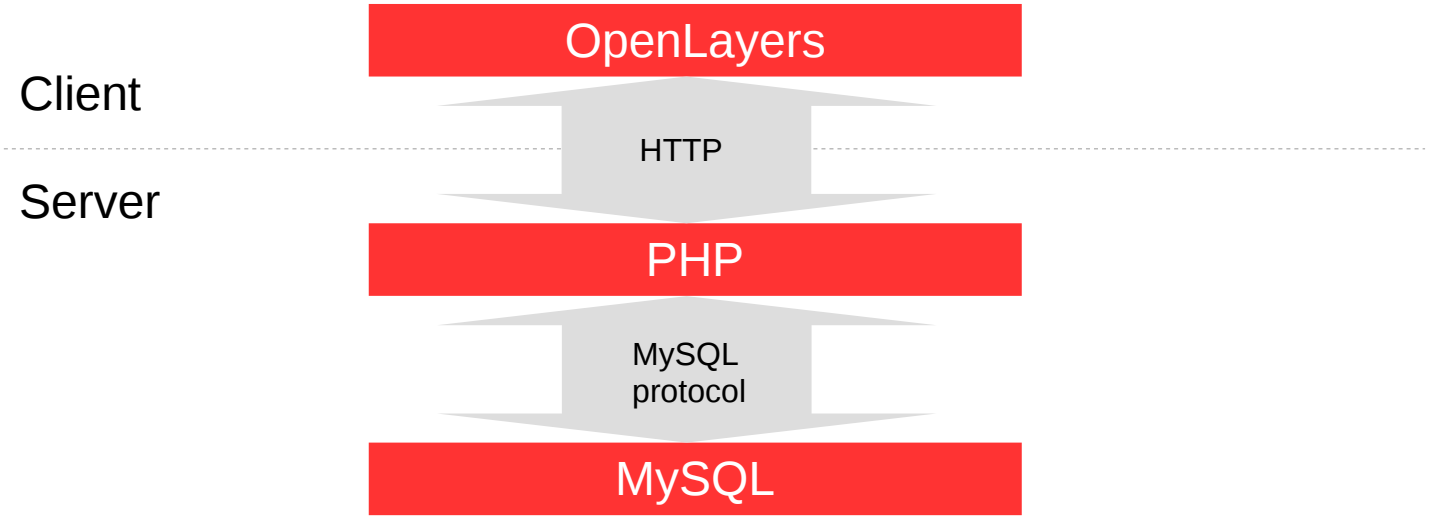
Limiting the dataset

- The unoptimized query returns every bar in Belgium
- Limit the dataset to the current viewport



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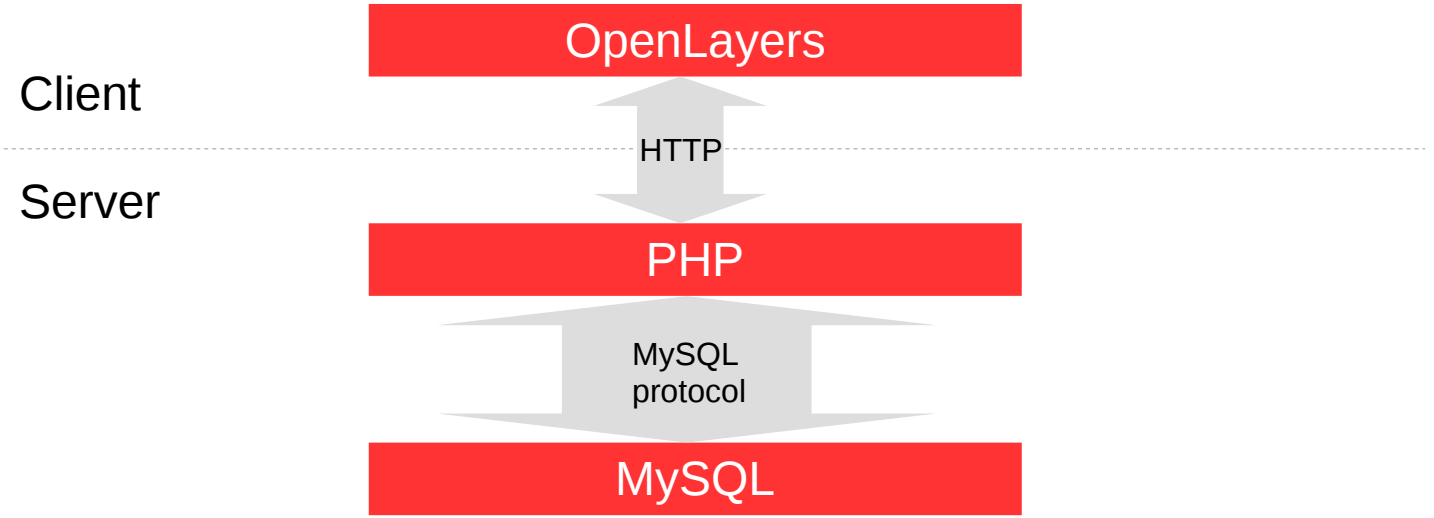

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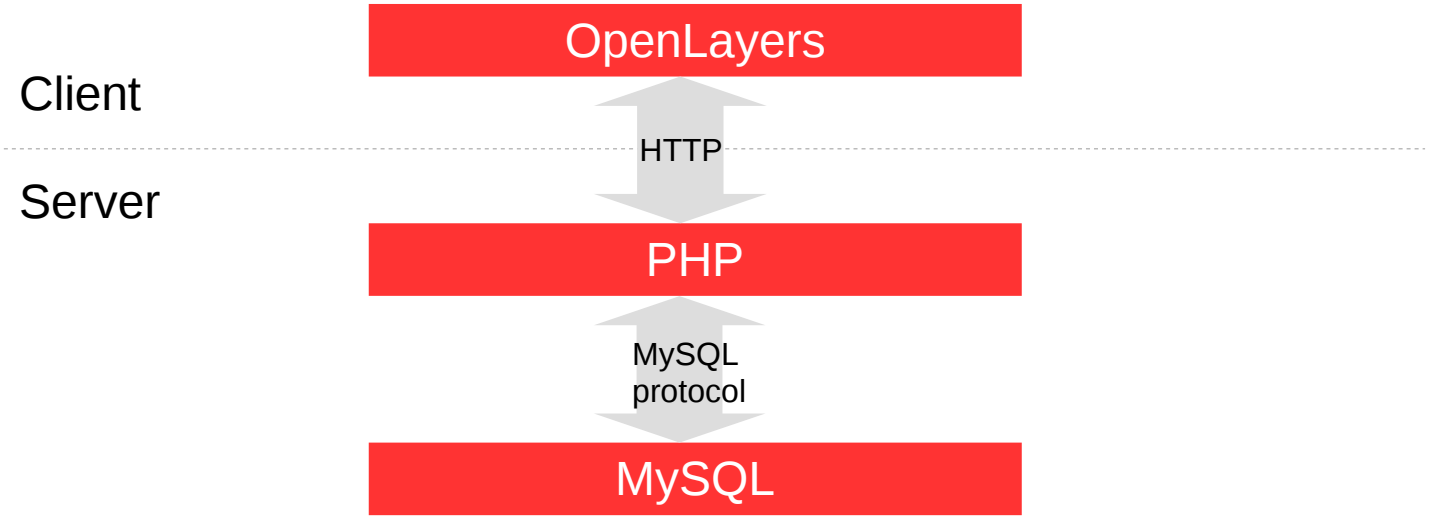

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   'properties',
   JSON_APPEND('{}', 'name', CONCAT('"', name, '"'))
) AS json
FROM bars
WHERE ST_Within
(
   position,
   ST_Envelope(ST_GeomFromText('MULTIPOINT(W S, E N)'))
);
```

Query

```
SELECT JSON_APPEND
(
   JSON_APPEND ('{"type":"Feature"}', 'geometry', ST_AsGeoJSON(position)),
   'properties',
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) AS json
FROM bars
WHERE ST_Within
(
   position,
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);
```
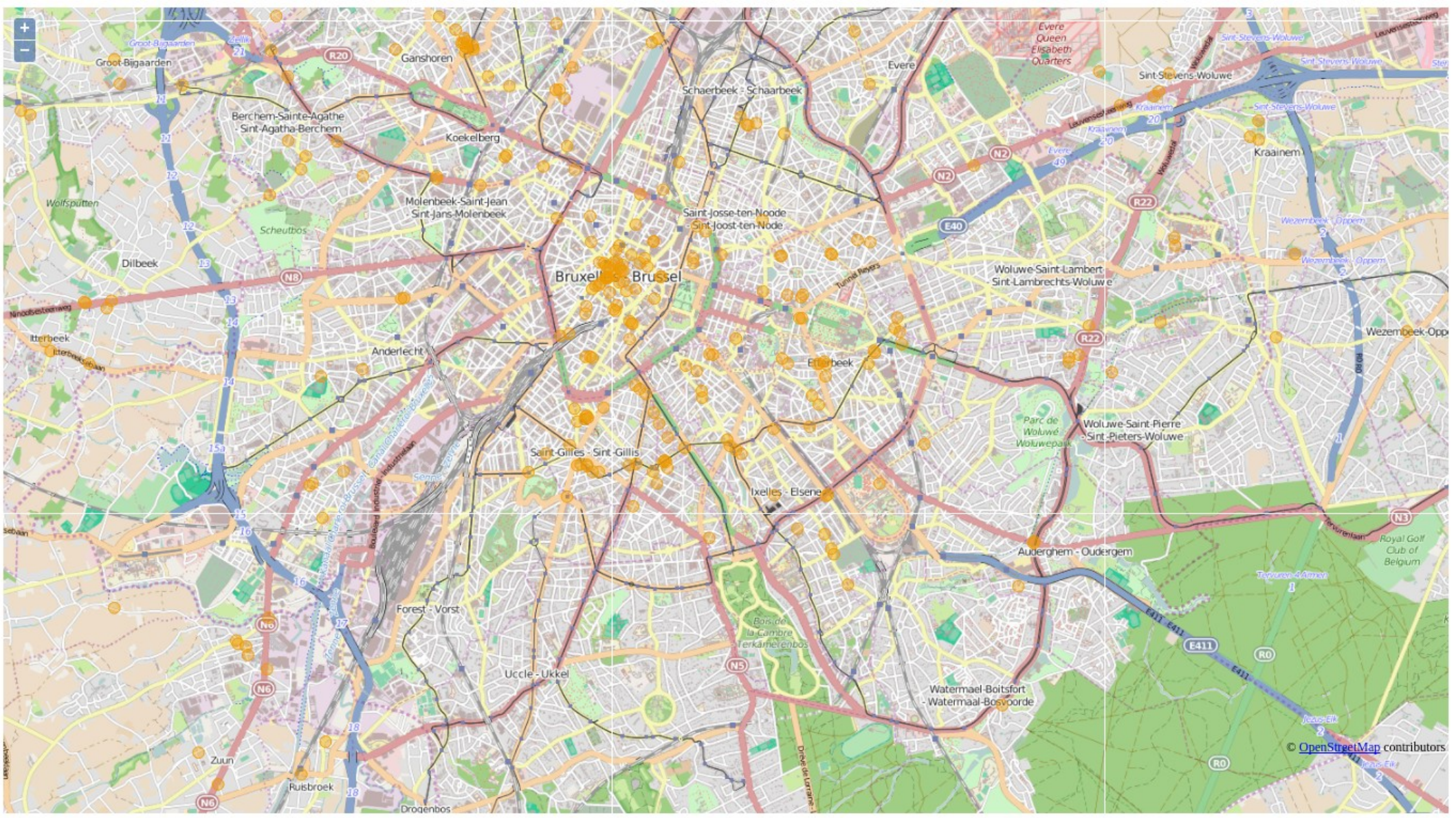

```
$bbox = $_GET['bbox'];
```

Using the R-tree index

- MySQL 5.7.5 provides R-tree indexes in InnoDB
  - Storing bounding boxes of geometric values
  - Speed up search
- The optimizer decides automatically when to use the index
  - Add ST_Within() or similar functions to the WHERE clause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Q & A

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