PostGIS

FEATURES SINCE V2

FELIX KUNDE

slides.com/fxku/postgis2

ABOUT ME

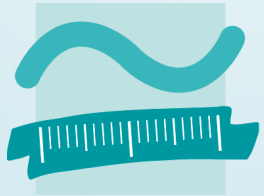
Research Assistant @ Beuth University Berlin

Geoinformatics background

Guest lecturer on spatial databases

Core dev for 3DCityDB and pgMemento

@FlxKu



BEUTH HOCHSCHULE
FÜR TECHNIK
BERLIN

University of Applied Sciences

WHAT IS POSTGIS?

(YOU ALL KNOW WHAT IT IS, RIGHT?)

- Extension to PostgreSQL database
- Comes with it's own datatypes for geodata
- Supports coordinate reference systems
- You can do all the operations known from a GIS
- Open Source under GPLv2
- More infos under http://postgis.net/

WHY IS IT GREAT?

- Build on top of one of the best DBMS
- Faster and more robust than your GIS
- So much geo power with just some SQL
- Great acceptance in the spatial industry

@delawen on PostGIS day

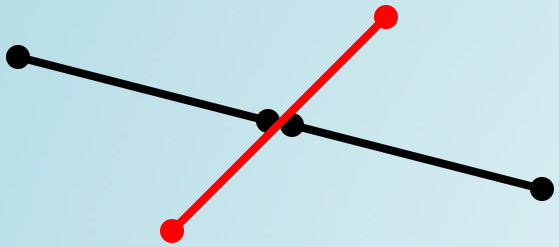
POSTGIS 2.0

2012/04/03

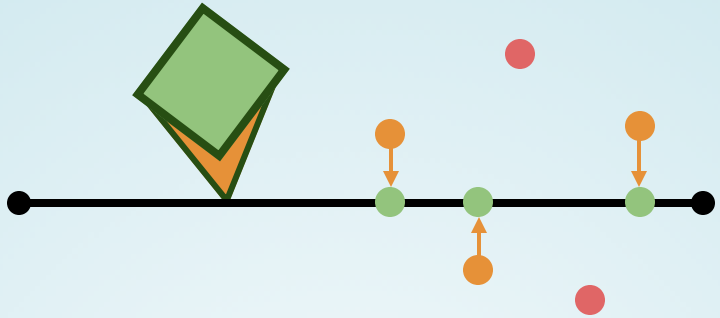
POSTGIS 2.0

- New binary serialization (OGC compliance)
- Typemod for geo types >> *geometry(Point,4326)*
- Raster support got integrated
- 3D landed in PostGIS (new types and functions)
- n-dimensional indexing
- Indexed KNN queries
- Many new topology functions

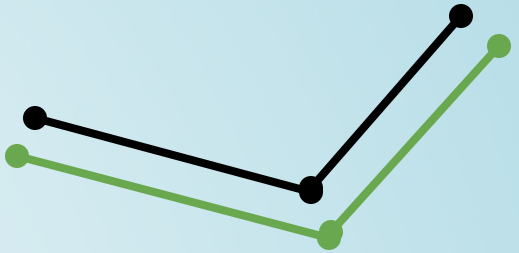
s3.cleverelephant.ca/foss4gna2012-postgis2.pdf



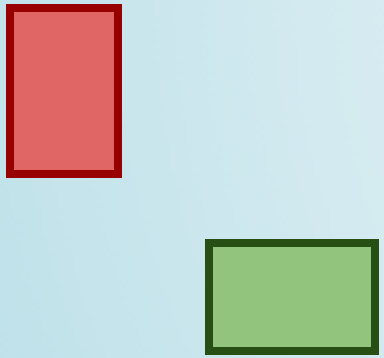
ST_Split



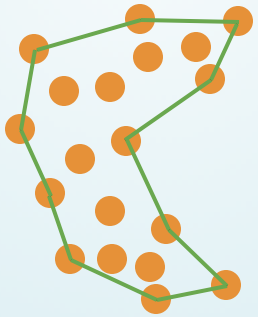
ST_Snap



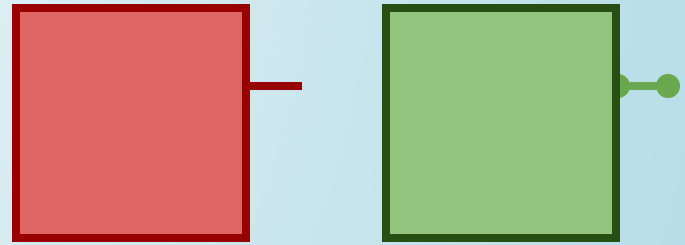
ST_OffsetCurve



ST_FlipCoordinates



ST_ConcavHull



ST_MakeValid

POSTGIS 2.1

2013/08/17

~ Raster ~

Raster Master

Many functions rewritten in C

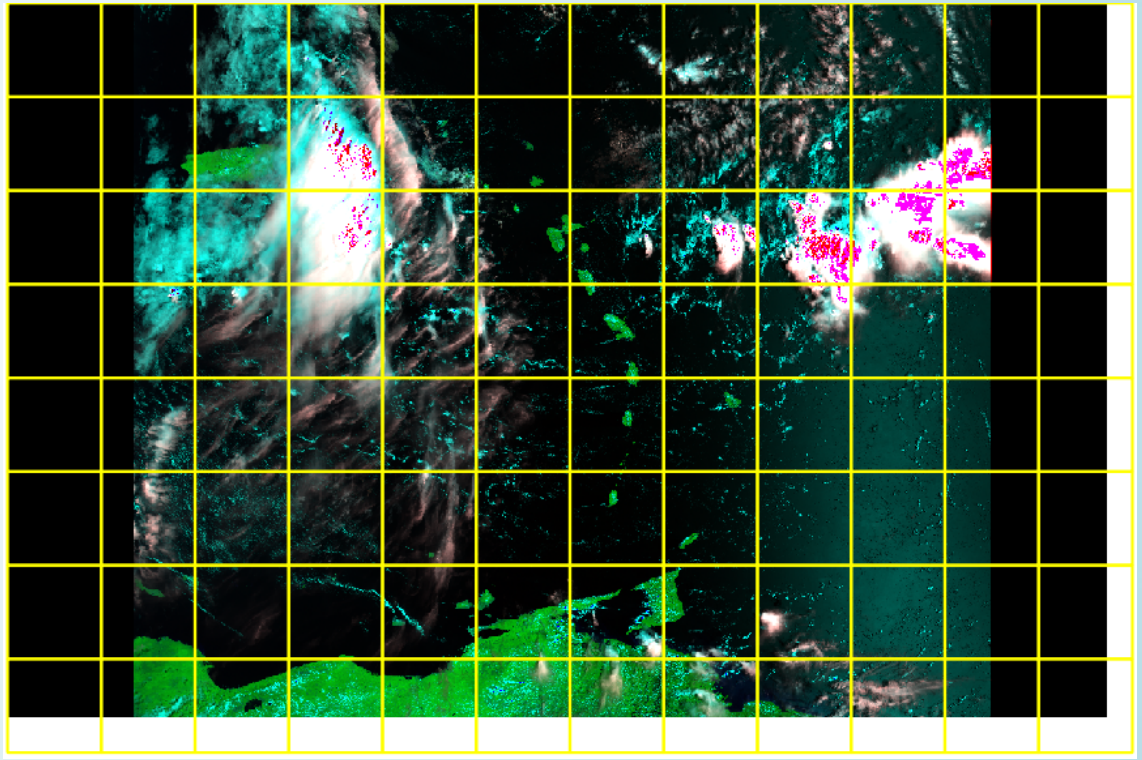
Join functions (ST_Contains, ST_DWithin etc.)

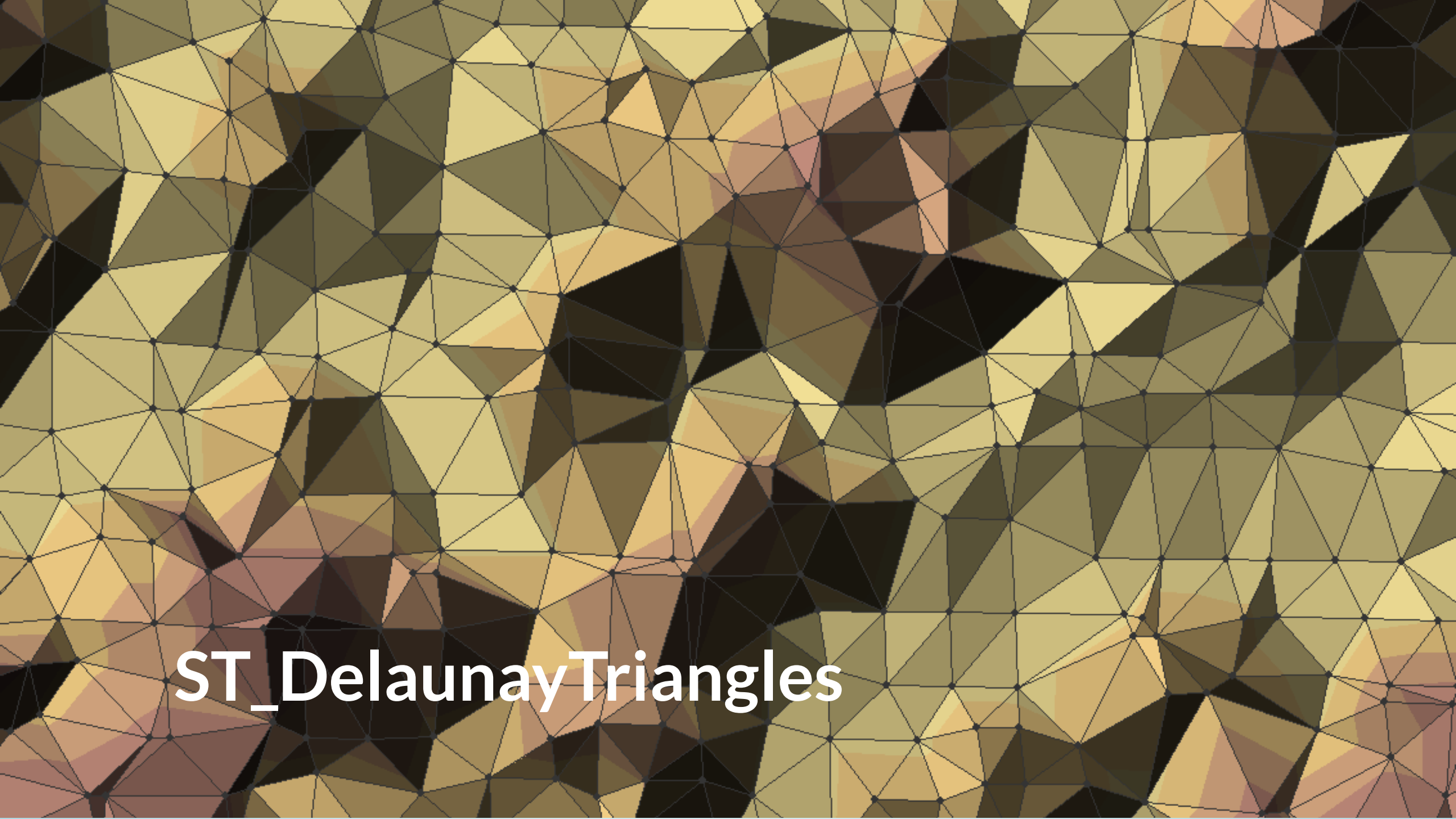
Splitting up rasters with **ST_Tile**

Multiband-aware **ST_Union**

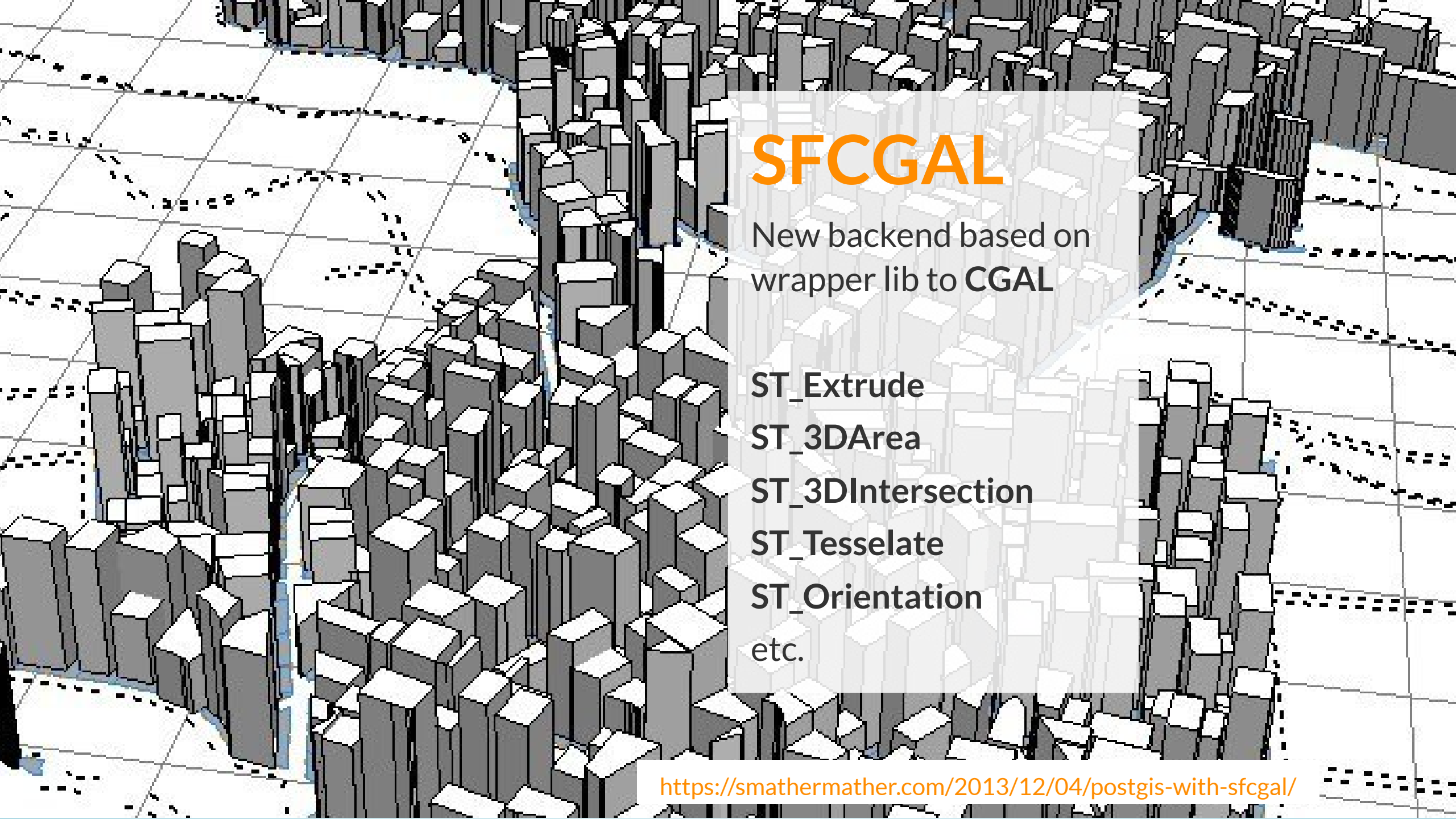
More terrain analysis functions (e.g. Roughness)

etc. etc. etc.





ST_DelaunayTriangles



SFCGAL

New backend based on wrapper lib to **CGAL**

ST_Extrude

ST_3DArea

ST_3DIntersection

ST_Tesselate

ST_Orientation

etc.

https://smathermather.com/2013/12/04/postgis-with-sfcgal/

THERE'S MORE

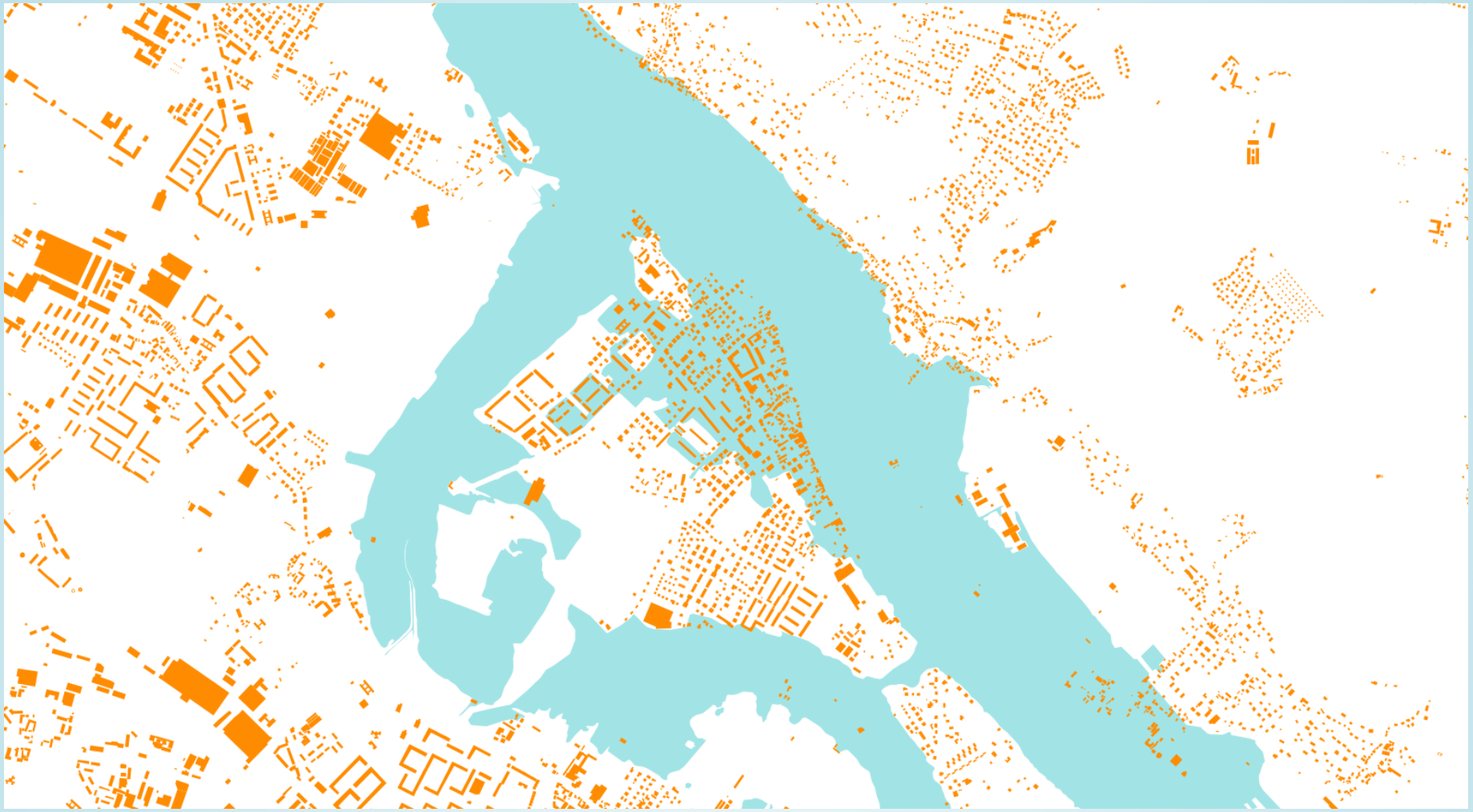
- Performance boost for several functions
- **ST_Distance** for arcs
- TopoGeometry >> TopoJSON
- New R-Tree Node Splitting

9.1+

POSTGIS 2.2

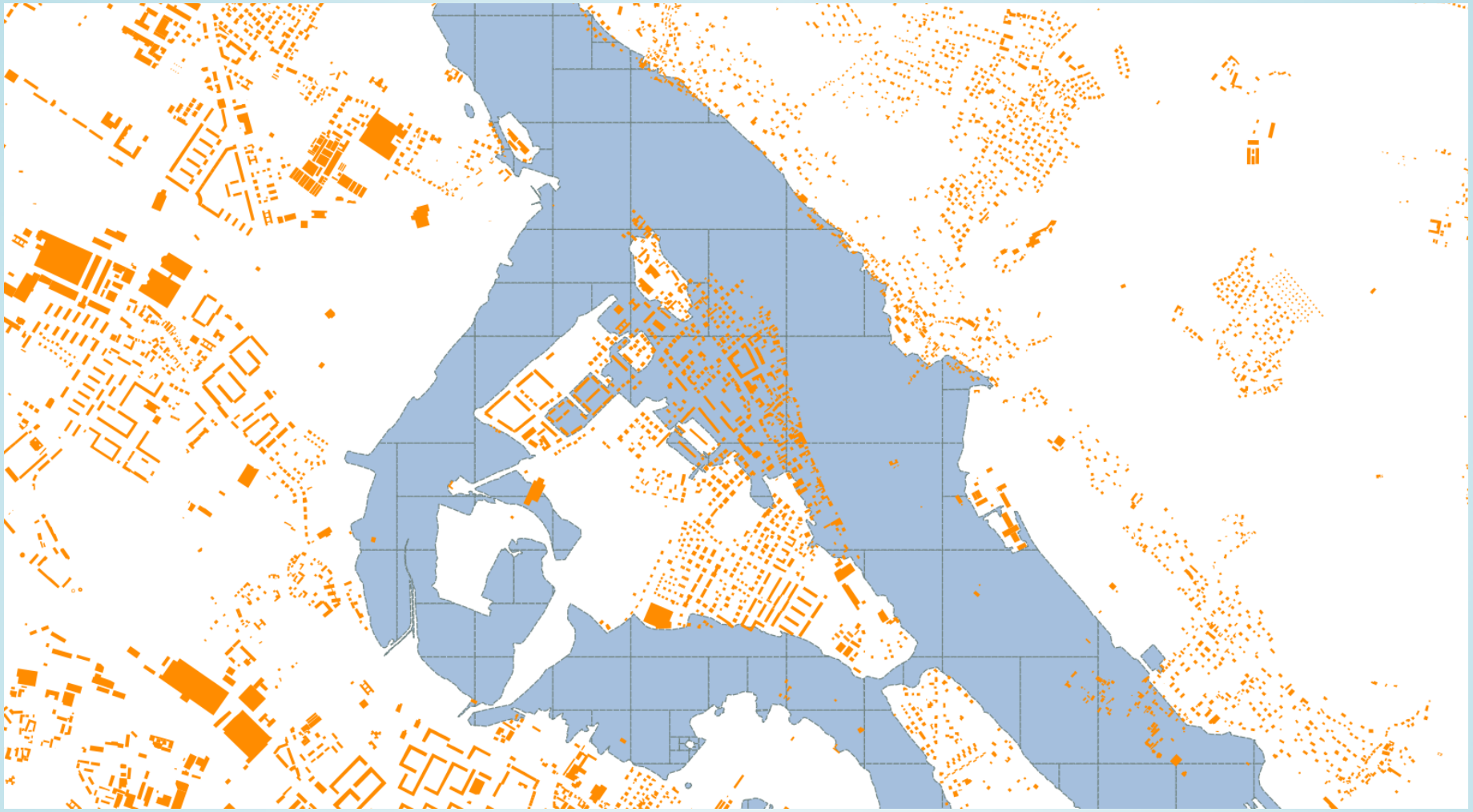
2015/10/07

~ 3D & 4D ~



ST_Subdivide

(ST_Segmentize for lines)



ST_Subdivide

(ST_Segmentize for lines)

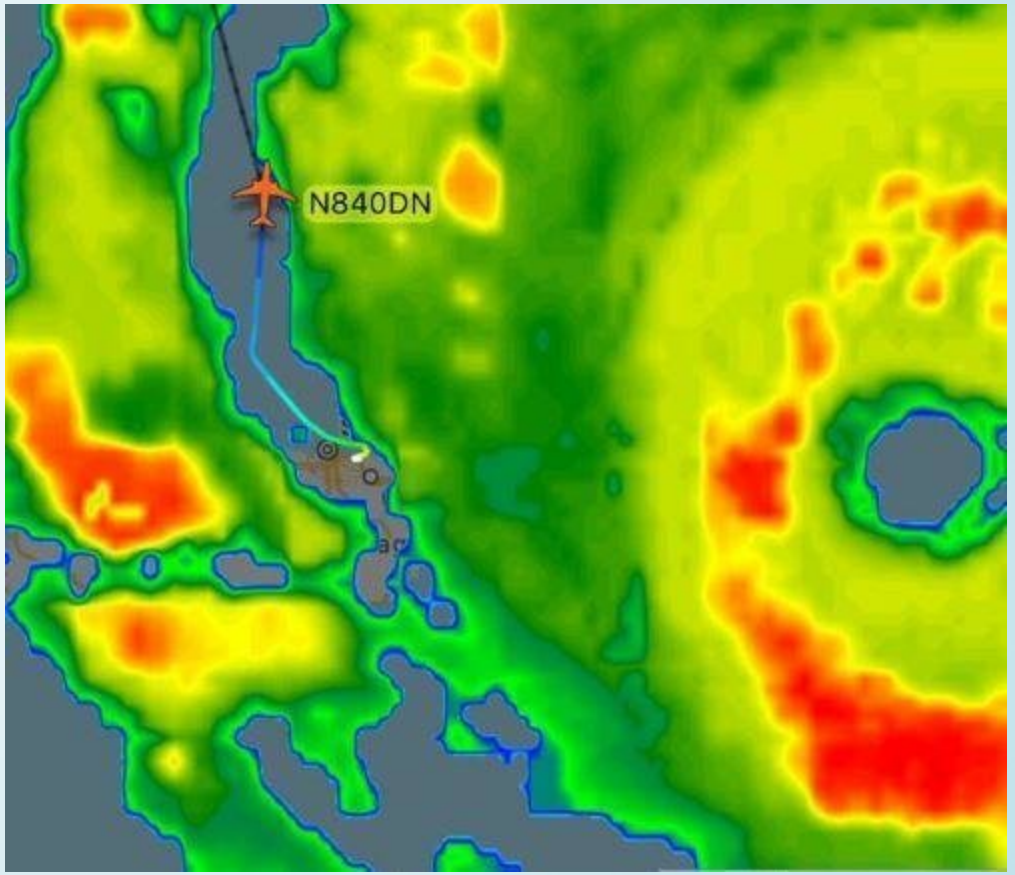
Temporal functions

ST_ClosestPointOfApproach

ST_DistanceCPA (or |=| operator)

ST_CPAWithin

ST_IsValidTrajectory



flightradar24.com

More SFCGAL

ST_Volume (e.g. for estimating energy demand for 3D buildings)

ST_MakeSolid (for PolyhedralSurface)

ST_IsSolid

ST_3DUnion & ST_3DDifference

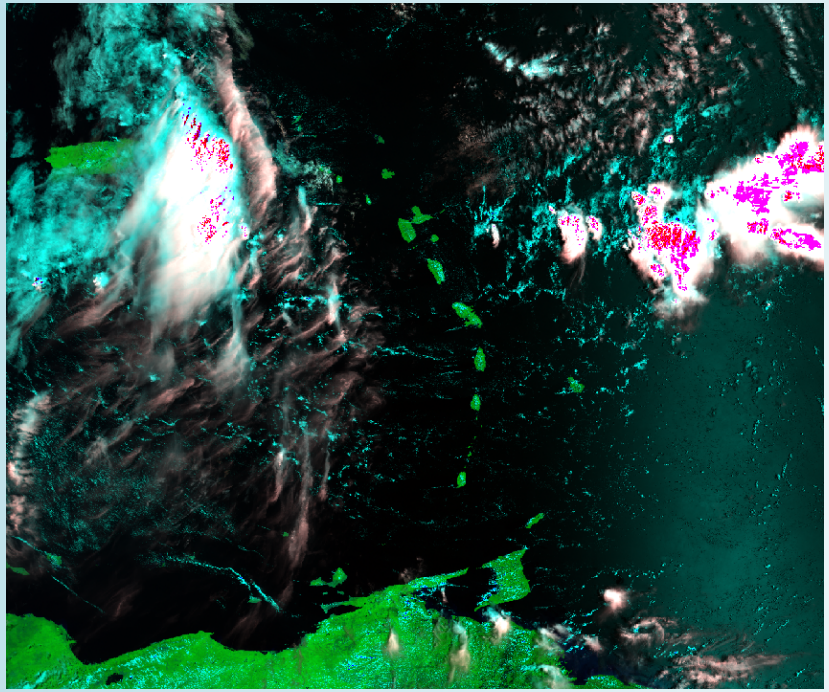
ST_ApproximateMedialAxis (e.g. to create rooftops)

SFCGAL can be added as extension:

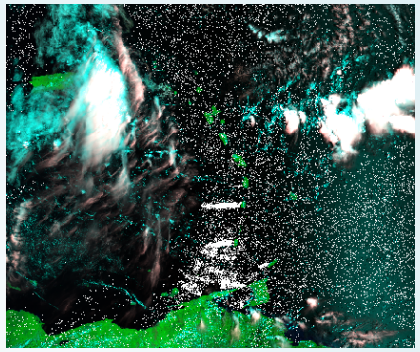
```
CREATE EXTENSION postgis_sfgcal;
```

3D city model of Vienna

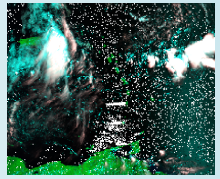
Original



Factor 2



Factor 4



ST_CreateOverview & ST_Retile

(Raster pyramids)

Compress Geometry with

ST_AsTWKB

```
SELECT
  pg_size_pretty(sum(ST_MemSize(geom))) AS original,
  pg_size_pretty(sum(length(ST_AsTWKB(geom)))) AS twkb
FROM
  vorarlberg.wald;

original |   twkb
---------------------
  17 MB  |  2333 kB
```

More: https://carto.com/blog/smaller-faster/

THERE'S MORE

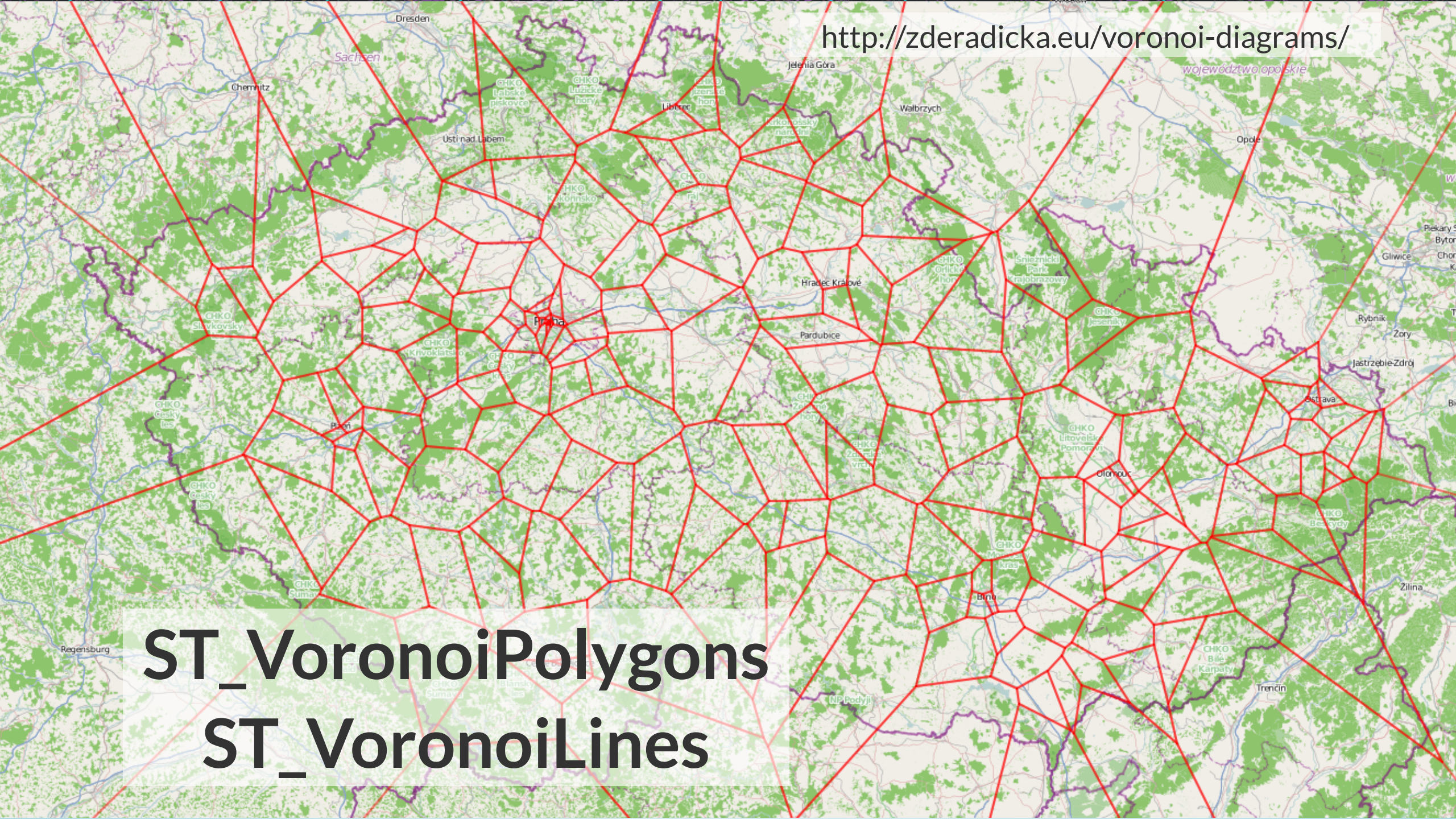
- KNN for geography
- Exact KNN via recheck (PG 9.5)
- A new way to simplify: **ST_SimplifyVW**
- Mark importance of points with **ST_SetEffectiveArea**
- **ST_RemoveRepeatedPoints** with tolerance
- **ST_SwapOrdinates** between all dimensions
- PostGIS Topology API in C

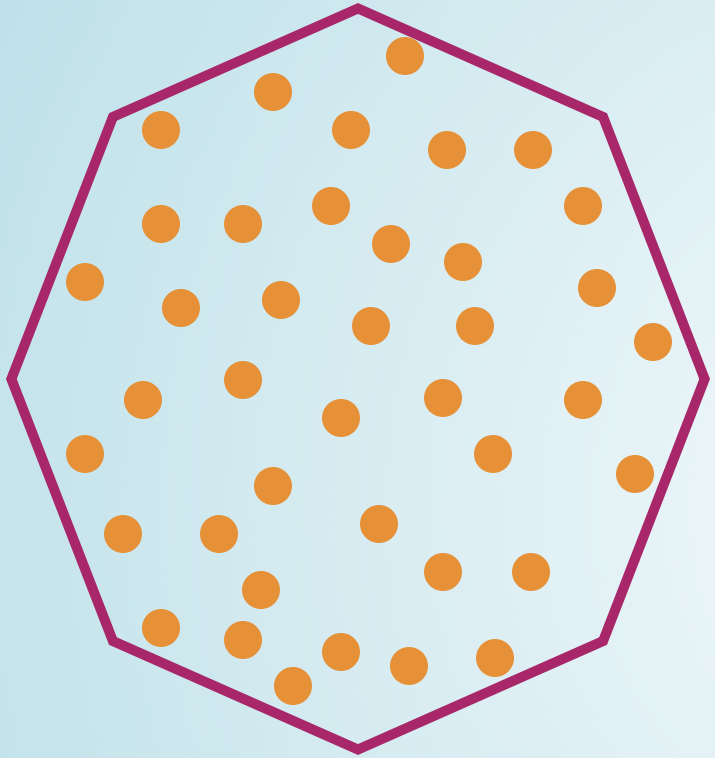
9.1+

POSTGIS 2.3

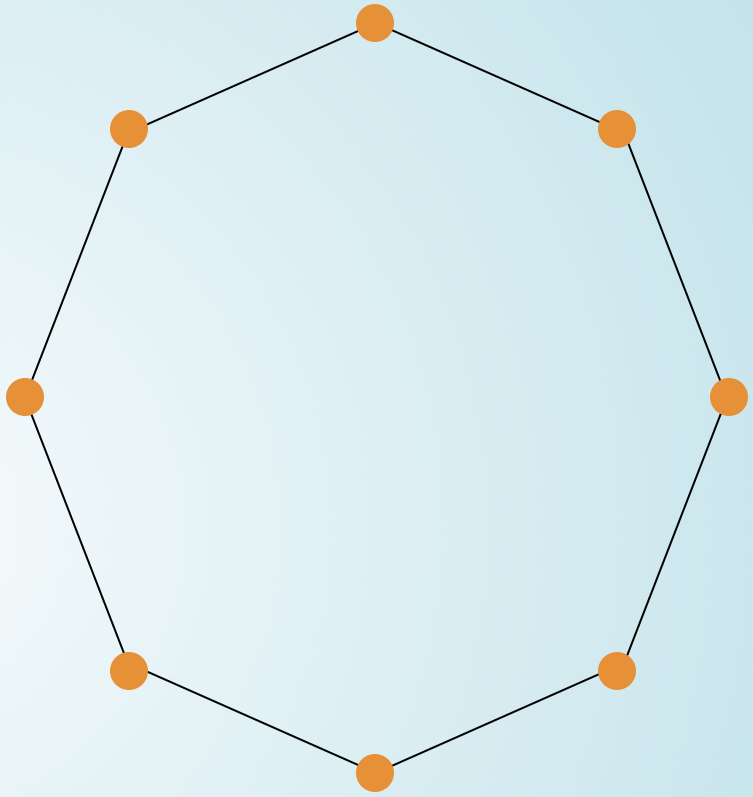
2016/09/26

~ Analytics ~


http://zderadicka.eu/voronoi-diagrams/
ST_VoronoiPolygons
ST_VoronoiLines



ST_GeneratePoints

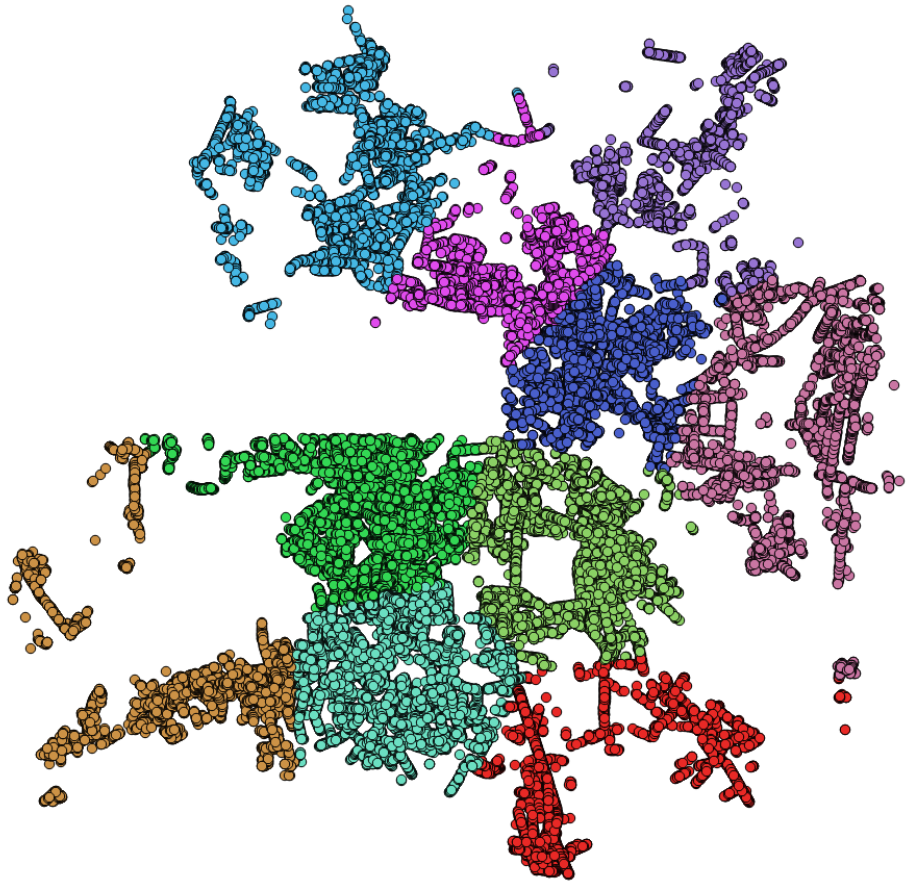


ST_Points

(returns MultiPoint)

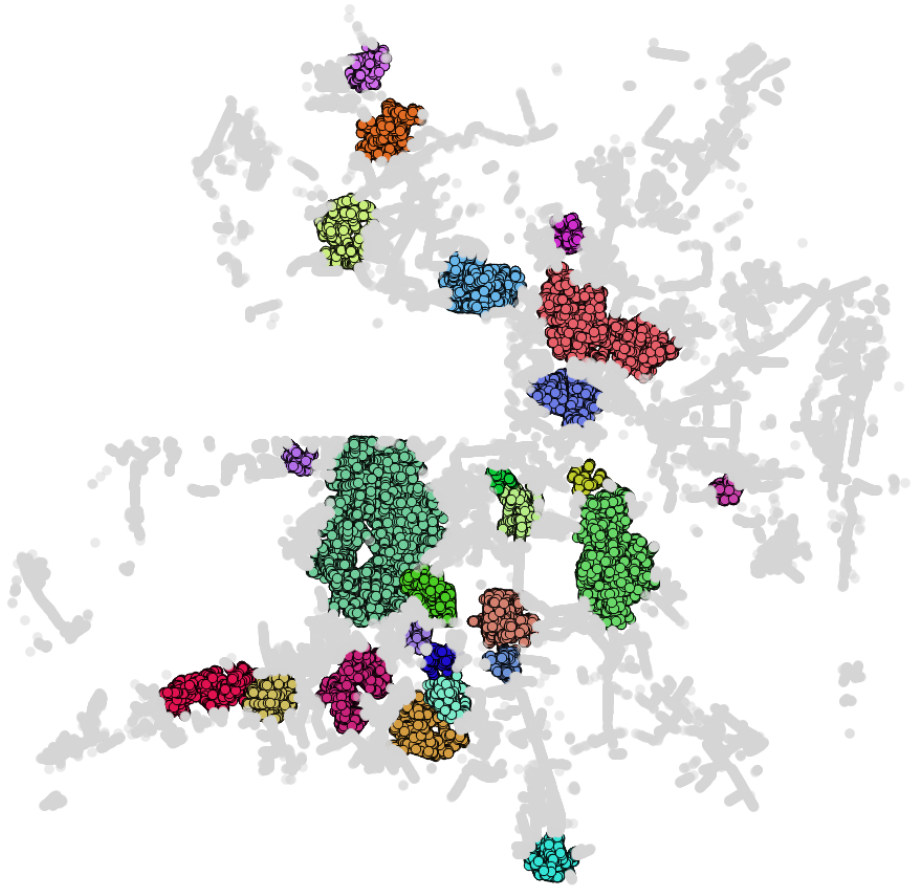
Performance: http://www.danbaston.com/posts/2016/12/17/generating-test-data-in-postgis.html

Polygon splitting: http://blog.cleverelephant.ca/2018/06/polygon-splitting.html



ST_ClusterKMeans

(simple, fast)

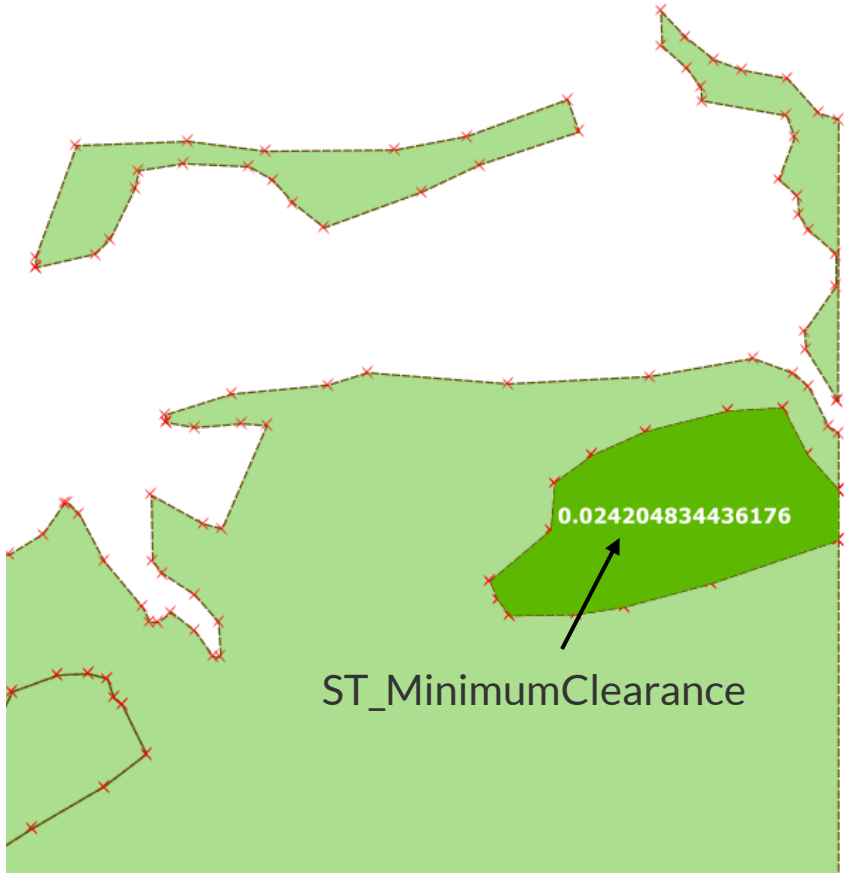


ST_ClusterDBSCAN

(more realistic, but harder)

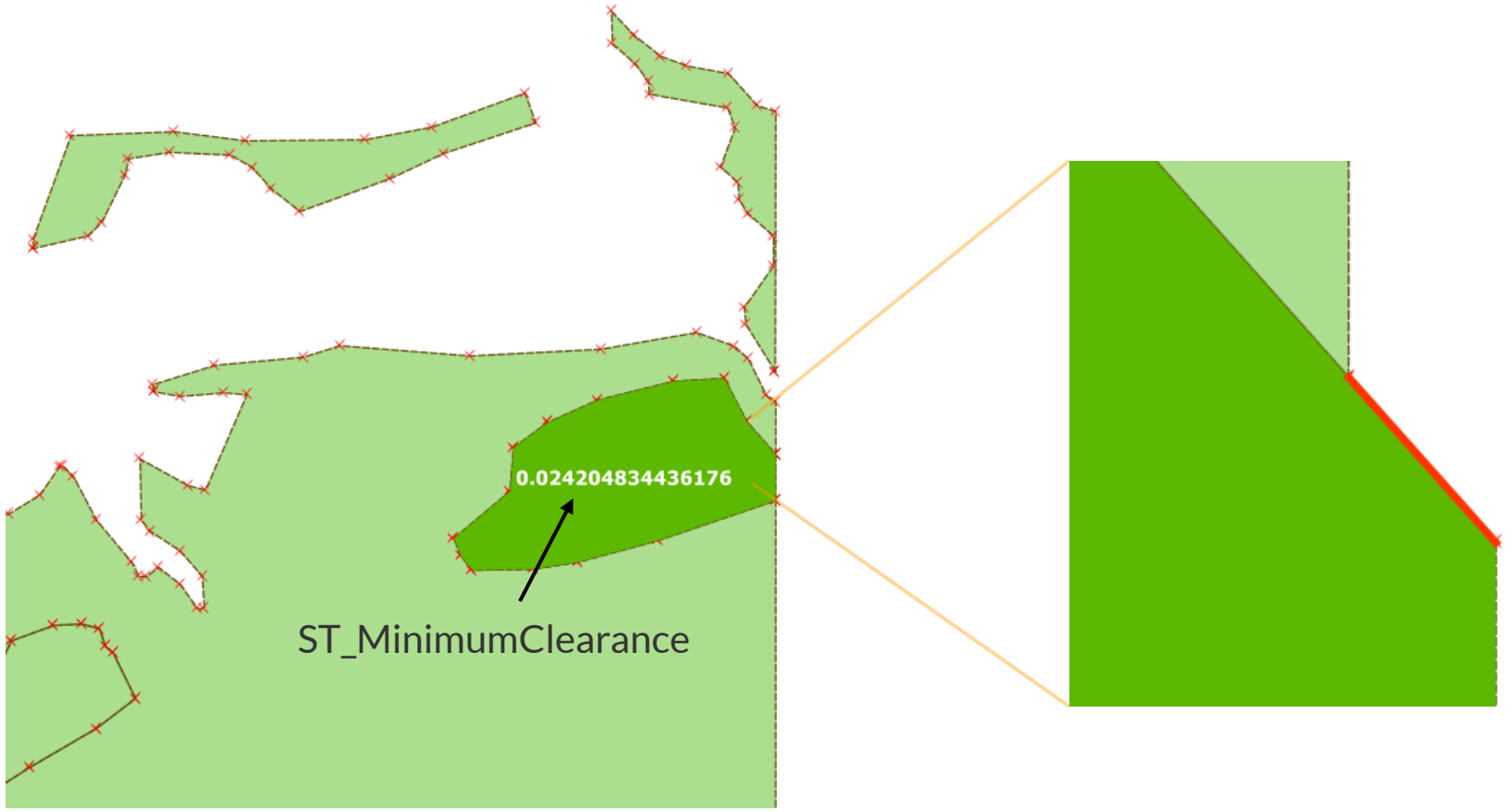
Minimum Clearance

(a.k.a. how close you are to **invalidity**)



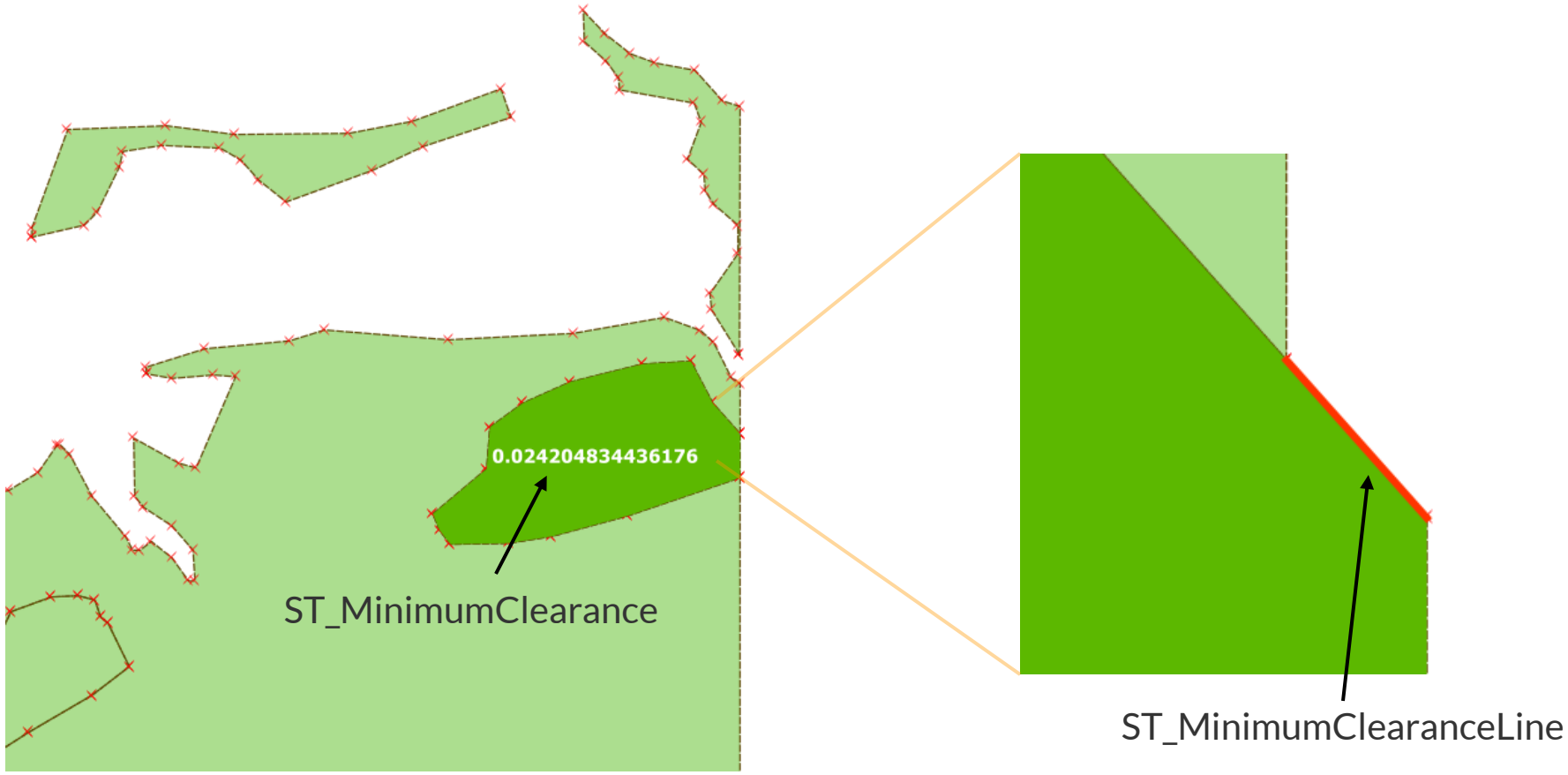
Minimum Clearance

(a.k.a. how close you are to **invalidity**)



Minimum Clearance

(a.k.a. how close you are to invalidity)



THERE'S MORE

- Parallel query through PG 9.6
- **BRIN Index** support
- **ST_Expand** seperatly for each dimension
- **ST_MakeLine** for MultiPoints
- **ST_MinimumBoundingRadius** (and circle)
- box3d::geometry = 3D geometry

9.2+

POSTGIS 2.4

2017/09/30

~ Vector Tiles ~

Vector Tiles Export

https://www.mapbox.com/vector-tiles/

ST_AsMVTGeom (for geometry)

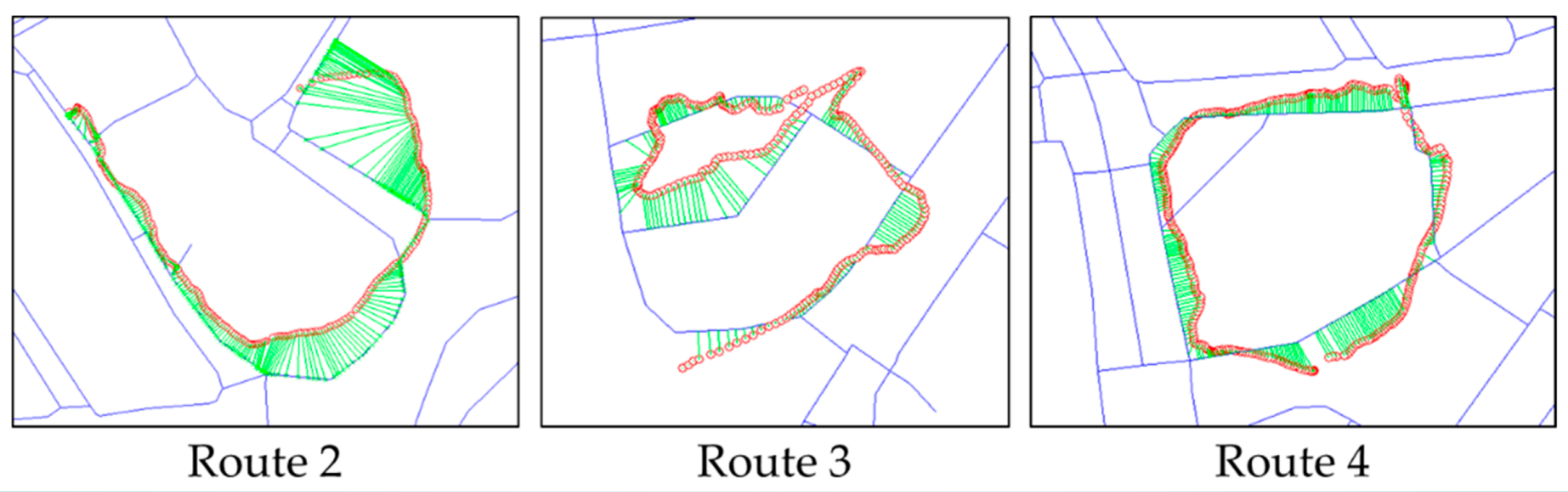
ST_AsMVT (MVTGeom + attributes)

@__phiphou__ (https://twitter.com/__phiphou__/status/878599027473952769)

https://carto.com/blog/inside/MVT-mapnik-vs-postgis/

ST_FrechetDistance

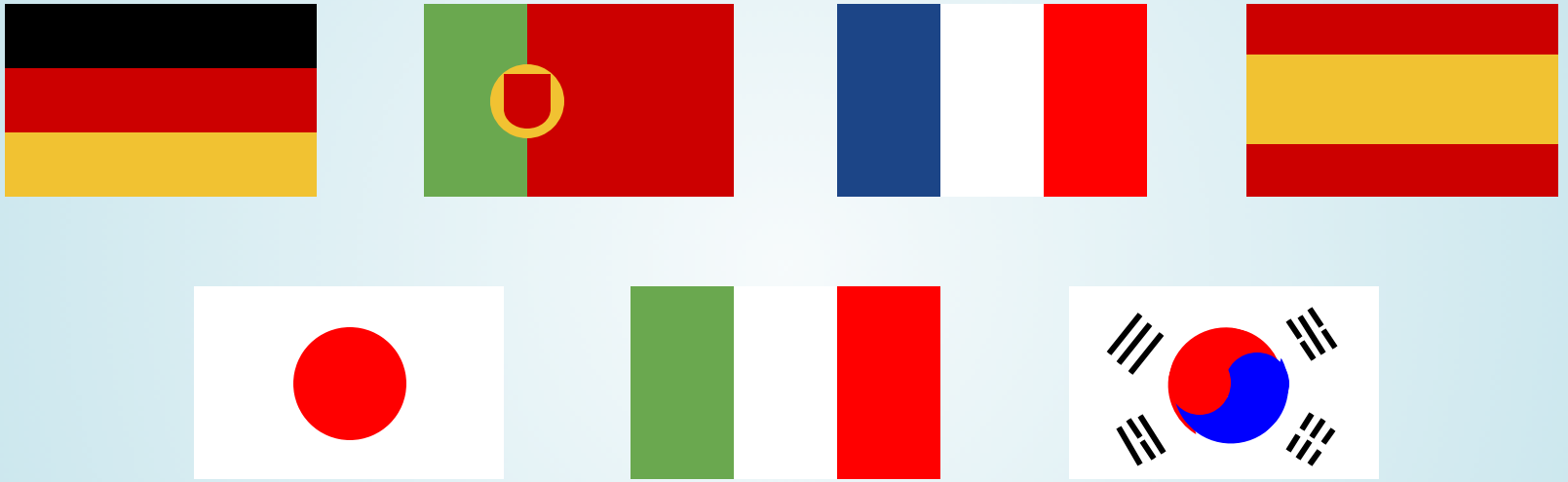
(a.k.a. how similar a two curves)



Source: http://www.mdpi.com/1424-8220/16/10/1768

Bang, Y. ; Kim, J. ; Yu, K. (2016): An improved map-matching technique based on the Fréchet distance approach for pedestrian navigation services. In: *Sensors* 16.10: 1768.

Languages (Help and Manual)



Source: http://www.bostongis.com/blog/index.php?/archives/267-PostGIS-db-help-and-manual-in-different-languages.html#extended

THERE'S MORE

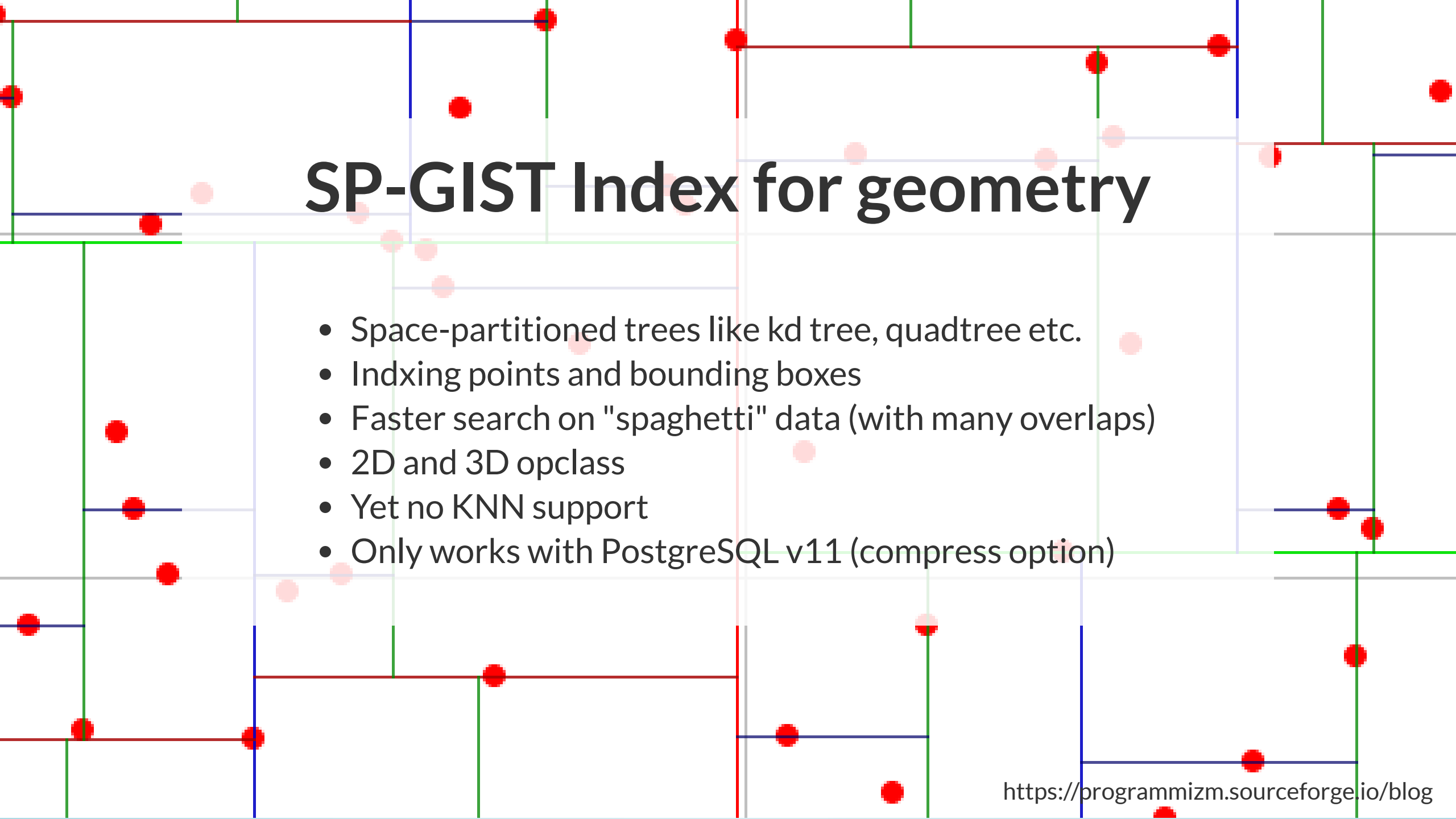
- Geometry and raster aggregates are **PARALLEL** SAFE
- Lossless binary compression with **ST_AsGeobuf**
- Check and force orientation of polygons
- GeomA = GeomB actually means it! (unlike ST_Equals)
- Covers support for GEOGRAPHY

9.3+

POSTGIS 2.5

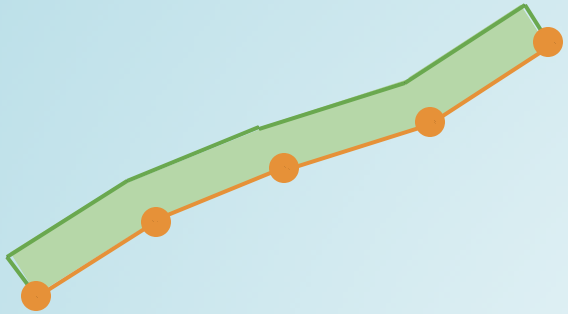
2018/09/23

~ Miscellanuous ~



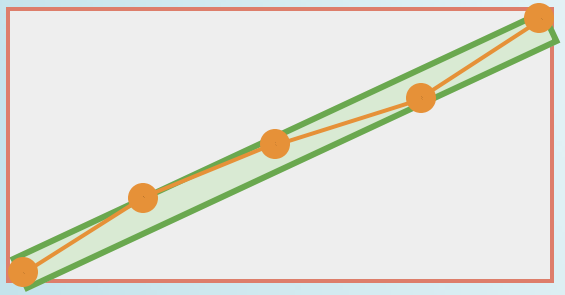
SP-GIST Index for geometry

- Space-partitioned trees like kd tree, quadtree etc.
- Indxing points and bounding boxes
- Faster search on "spaghetti" data (with many overlaps)
- 2D and 3D opclass
- Yet no KNN support
- Only works with PostgreSQL v11 (compress option)

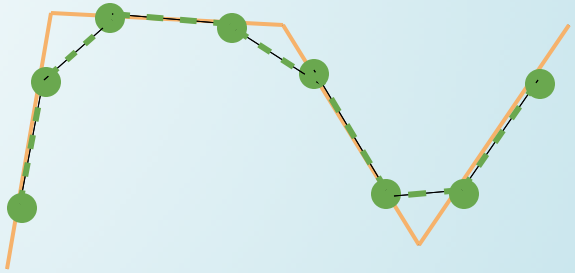


ST_Buffer with 'side={left | both | right}'

ST_FilterByM



ST_OrientedEnvelope
(ST_MinimumRectangle)



ST_ChaikinSmoothing
(Iterate to create Bezier curves)

THERE'S MORE

- Better parallel query support (#3561 #3751 #3927)
- **ST_AsText**(geom, maxdecimaldigits)
- **ST_GeomFromGeoJSON** can consume JSON/B
- **ST_LineInterpolatePoints** with repeat function
- **ST_Angle** between 3 pts or 2 vectors
- **ST_Greyscale** for raster
- Extended out-db band settings
- **ST_QuantizeCoordinates** to reduce precision
- Geometry is hashed in CTEs
- etc. etc.

9.4+

POSTGIS 3.0

2019/20

- Make **upgrades** less painful! Change lib name.
- New **disk format**? External storage type?
- **Raster** in or out of Core?
- **Tolerance & Precision** (#1629)?
- 3D-aware geography?
- **Index-only scans** with geometry?
- **nD-Geometry**, e.g. for trajectories?
- Cast to JSON / JSONB (#3687)?
- osm2topology converter?
- Apply some "modern" C?
- https://trac.osgeo.org/postgis/wiki/PostGIS3

Google Summer of Code 2018

pgAdmin4 plugin for viewing data

Mentors: *Victoria Rautenbach* *and Frikan Erwee*

pgAdmin graphical user interface (GUI) administration tool for PostgreSQL that allows you to execute spatial queries using PostGIS on geospatial data. Currently, there is no integrated geospatial data viewer in pgAdmin and external applications, such as QGIS, are required. For this project, you will develop a GUI that allows users to view the tables in a spatial database and the results of queries executed as geometries. Also, refer to this page for more detail on the project.

Languages and APIs: Python, JavaScript? and JavaScript? APIs such as, require.js, bootstrap and OL3.

Test for potential students:

Task 1: Write a Python program to construct an array by repeating the values within the original array three times.

Expected Output:

Original array [1, 2, 3, 4]

Repeating 2 times [1 2 3 4 1 2 3 4]

Repeating 3 times [1 2 3 4 1 2 3 4 1 2 3 4]

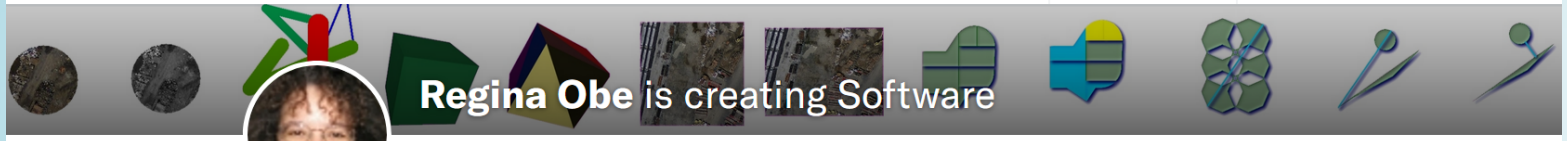
Task 2: Create a basic web map using OpenLayers? displaying JSON layer, also ensure that you bootstrap the page. You can use any open data JSON layer, for example, datasets from the World Bank Open Data Portal.

POSTGIS FUND ME

- Spatial partitioning via PG 10+ (~ #181)
- Fixed precision for overlays (#4001)
- Geoprocessing with GEOGRAPHY (#3973)
- ST_Blur & ST_Sharpen for raster (#2598, #2599)
- Raster KDE (#2894)
- Improvements for postgis_topology
- https://trac.osgeo.org/postgis/milestone/PostGIS%20Fund%20Me

ONE WAY TO FUND

PATREON | Search | Create On Patreon | Explore Creators



Overview | Posts | Community | BECOME A PATRON

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per month

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GOALS View all

$284 of $800 per month

- Infrastructure improvements in testing framework, support for testing on more OS, upgrade testing
- Buildbot maintenance
- General maintenance bug fixing, keeping up with PostgreSQL changes

Hi, I'm Regina Obe and I'm a core contributor to the PostGIS project.

I do a number of things related to PostGIS.

I package PostGIS / pgRouting for Windows users both 32-bit and 64-bit which is distributed via EDB Application stack builder.
I maintain and enhance the PostGIS tiger geocoder.
I developed and enhance the ST_AsX3D out function.
I maintain the PostGIS Jenkins buildbots which do windows builds, source tar ball, and PDF/HTML documentation generation.
I do a lot of testing on various platforms.
I wrote a good chunk of the manual and continue to improve it.

I've co-authored several books on PostGIS, PostgreSQL, and pgRouting.

Unfortunately all of this work
takes a non-trivial amount of time each month that is not paid for by my client work.

This forces me to make a compromise of time to spend on these important
activities vs. getting paid for work. This leaves me feeling guilty for letting these things slide.

If I got paid for this PostGIS work, I wouldn't have to neglect these PostGIS activities
and in fact would be able to do more of them.

On the horizon is:

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TIERS

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I will send you one of the books I've written autographed. Choose from PostGIS In Action 2nd, pgRouting: A Practical Guide, or PostgreSQL: Up and Running 3rd edition.

JOIN $50 TIER

Darafei Praliaskouski
Jul 23 at 2:22am

A day of fixing raster

Today user vinnix came to PostGIS IRC channel and told that he follows some PostGIS exercises he found on the web. In tutorial the queries were succeeding, and on his run they were giving a TopologyException.

Continue reading

postgis

1 Like

Log in to comment ...

Darafei Praliaskouski
Jul 21 at 11:53pm

Baking PostGIS 2.5beta2

Today I spent a day fixing stuff for Moday's PostGIS release.

First thing I decided to fix was 32bit FreeBSD build. Recently PGDG Apt repo maintainer Christoph Berg shared a link to logs from Debian buildfarm, and I found that 32bit Ubuntu crashes at the same spot

Continue reading

postgis

1 Like

EXTERNAL PROJECTS YOU SHOULD KNOW

- Flexible routing engine with pgRouting
- Storing pointclouds with pgpointcloud
- OSM ETL: osm2pgsql, imposm
- Query on files (and more) with ogr_fdw
- Vector Tiles: Tegola, t-rex, tilesplash
- 3D City Database with export to Cesium
- <enter_your_domain_here>

THANKS

to

Regina, Paul, Sandro, Mark, Bborie,

Jorge, Nicklas, Dan, Olivier, Björn, Mateusz, Pierre, Darafei

Chris, Kevin, Dave, Jeff, Mark, David

Alex, Alex, Andrea, Andreas, Andreas, Anne, Arthur, Barbara, Ben, Bernhard, Brian, Bruce, Bruno, Bryce, Carl, Charlie, Dane, David, David, Eduin, Even, Esteban, Frank, George, Gerald, Gino, Guillaume, Iida, Ingvild, Jason, Jeff, Jose Carlos, Julien, Kashif, Klaus, Kris, Leo, Loic, Luca, Maria, Mark, Markus, Maxime, Maxime, Michael, Mike, Nathan, Nathaniel, Nikita, Norman, Rafal, Ralph, Rémi, Richard, Silvio, Steffen, Stephen, Tom, Vincent, Vincent

Teams behind GEOS, GDAL and Proj!

The whole PostgreSQL community!

The funding companies, organisations and individuals!