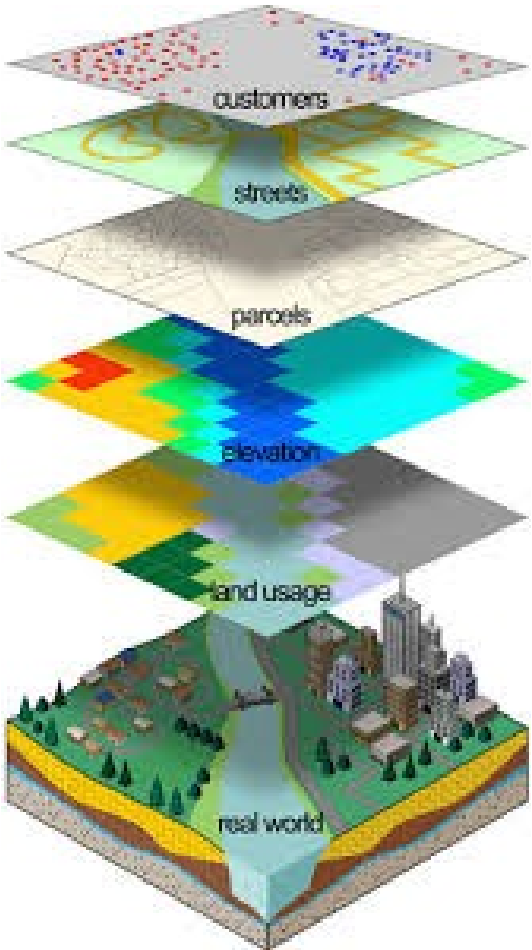
PostGIS

Vincent Picavet – Oslandia – www.oslandia.com

Post - G eographical I nformation S ystem

Capture, create, store, analyze, share, visualize data related to space



PostGIS

PostGIS 2.0 is out !

(.. since 2012 ..)

2012..

Internals

- New serialization format
  - New geometry types (3D)
  - Fix 2D only bounding boxes
  - Fix bytes alignment
- New parsers
  - WKB
  - WKT

Jenkins

search

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Jenkins

ENABLE AUTO REFRESH

People

Build History

Build Queue

No builds in the queue.

Build Executor Status

#	Status
1	Idle
2	Idle
3	Idle
4	Idle

All | GDAL | GEOS | PostGIS | PostgreSQL

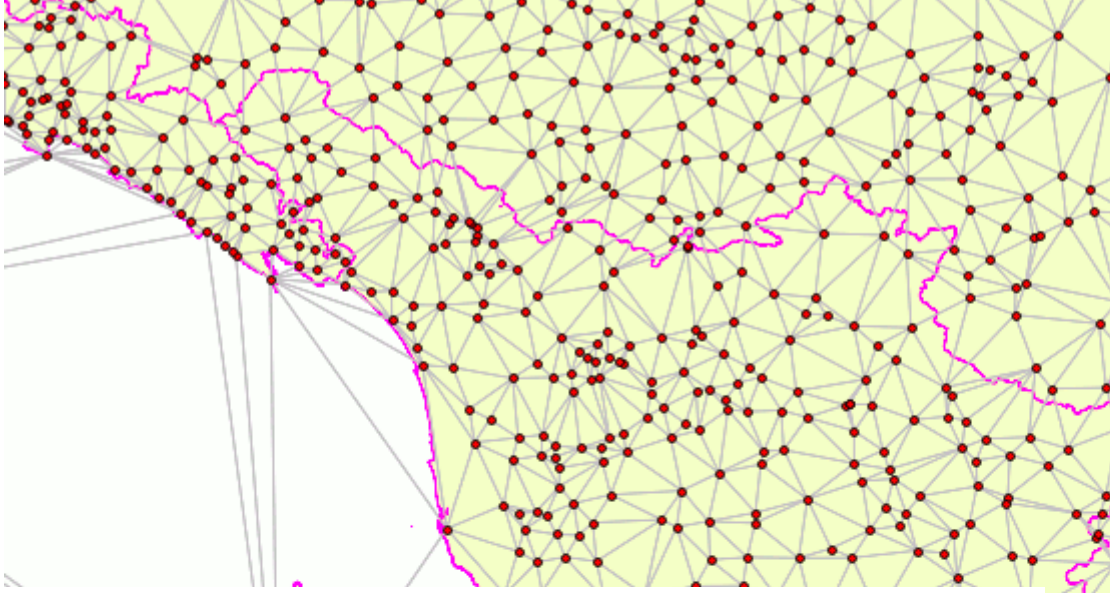
S	W	Name ↓	Last Success	Last Failure	Last Duration
		GDAL_PostGIS_Regress	1 day 17 hr (#113)	1 mo 1 day (#2)	5 min 2 sec
		GDAL_Regress	1 day 17 hr (#133)	5 days 15 hr (#127)	2 min 19 sec
		GDAL_Trunk	1 day 17 hr (#159)	20 days (#89)	17 min
		GEOS_Trunk	1 mo 7 days (#13)	N/A	2 min 28 sec
		PG_Version	11 days (#9)	1 mo 13 days (#6)	4 min 7 sec
		PG_Version_Dev	2 days 10 hr (#11)	1 mo 1 day (#4)	4 min 40 sec
		PostGIS_2.0	16 hr (#34)	4 days 20 hr (#29)	9 min 24 sec
		PostGIS_2.0_docs	16 hr (#48)	7 days 3 hr (#32)	10 min
		PostGIS_2.1	11 hr (#230)	2 days 21 hr (#220)	14 min
		PostGIS_2.1_docs	11 hr (#148)	16 hr (#145)	10 min
		PostGIS_2.1_doxygen	20 hr (#45)	8 hr 18 min (#47)	23 min

OSLANDIA

Functions

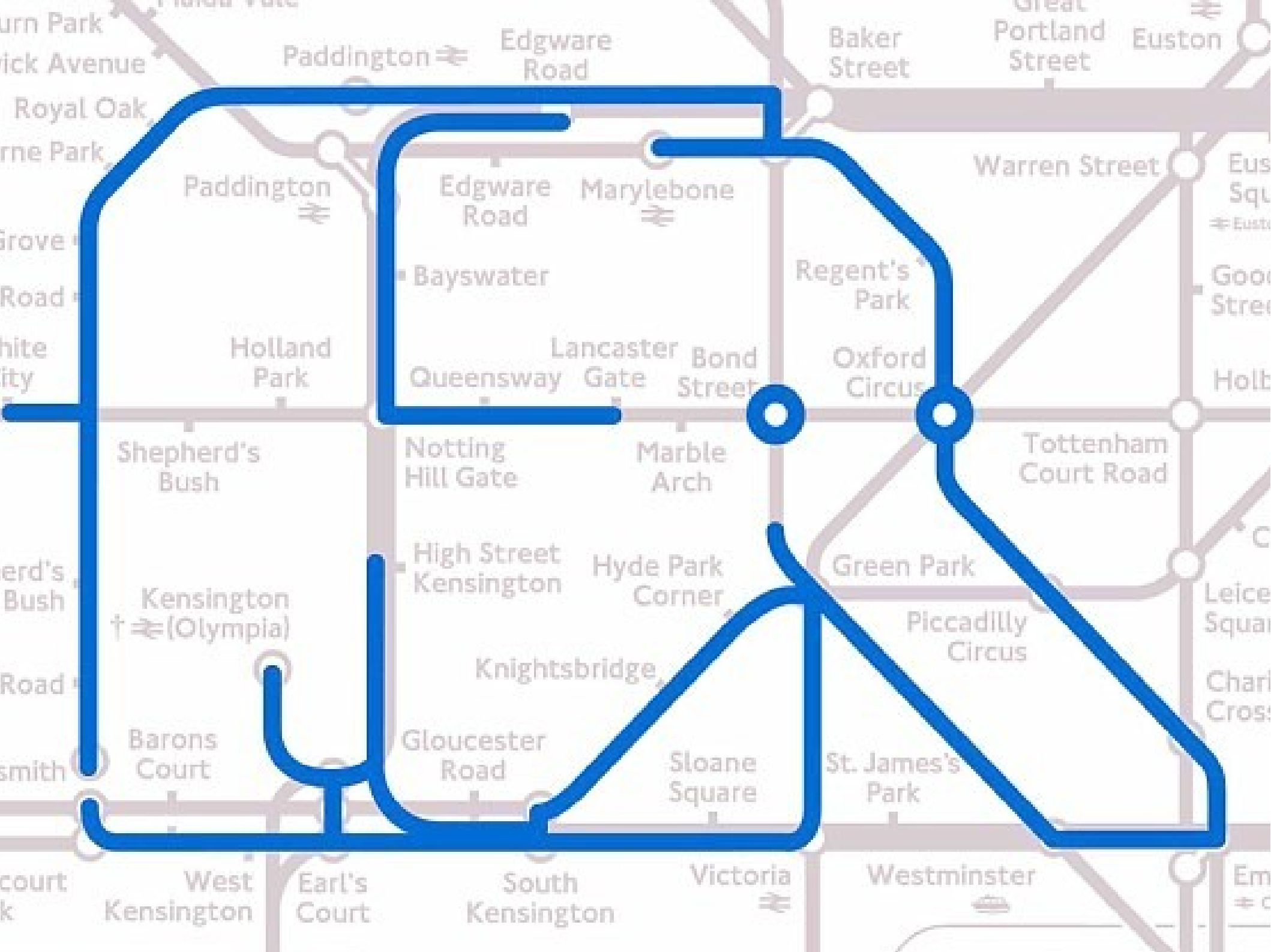
PostGIS 2.1

Released



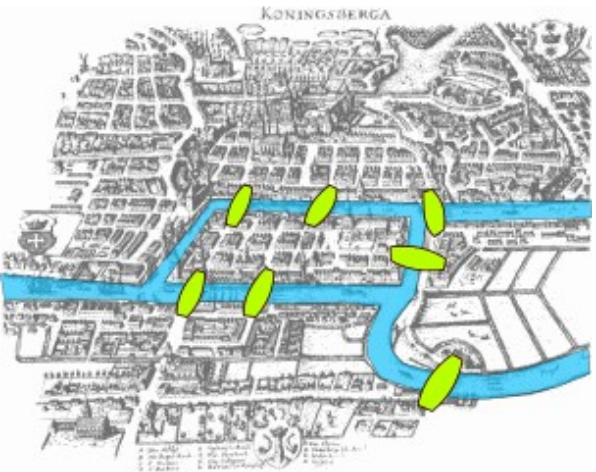
AsTopoJSON	ST_FromGDALRaster	ST_Roughness
clearTopoGeom	ST_GeomFromGeoHash	ST_SetValues
Get_Geocode_Setting	ST_InvDistWeight4ma	ST_Simplify
postgis_sfcgal_version	ST_MapAlgebra	ST_StraightSkeleton
Set_Geocode_Setting	ST_MinConvexHull	ST_Summary
ST_3DArea	ST_MinDist4ma	ST_Tesselate
ST_3DIntersection	ST_MinkowskiSum	ST_Tile
ST_ColorMap	ST_NearestValue	ST_Touches
ST_Contains	ST_Neighborhood	ST_TPI
ST_ContainsProperly	ST_Orientation	ST_TRI
ST_CoveredBy	ST_Overlaps	ST_Union
ST_Covers	ST_PixelAsCentroid	ST_Within
ST_DelaunayTriangles	ST_PixelAsCentroids	ST_WorldToRasterCoord
ST_DFullyWithin	ST_PixelAsPoint	UpdateRasterSRID
ST_Disjoint	ST_PixelAsPoints	Drop_Nation_Tables_Generate_Script
ST_DumpValues	ST_PixelOfValue	Loader_Generate_Nation_Script
ST_DWithin	ST_PointFromGeoHash	ST_NotSameAlignmentReason
ST_Extrude	ST_RasterToWorldCoord	ST_Box2dFromGeoHash
ST_ForceLHR	ST_Resize	Pagc_Normalize_Address

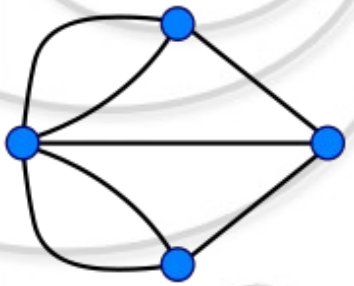
Topology


Paddington
Edgware Road
Baker Street
Great Portland Street
Euston
Royal Oak
Paddington
Edgware Road
Marylebone
Warren Street
Bayswater
Regent's Park
Holland Park
Queensway
Lancaster Gate
Bond Street
Oxford Circus
Shepherd's Bush
Notting Hill Gate
Marble Arch
Tottenham Court Road
High Street Kensington
Hyde Park Corner
Green Park
Kensington (Olympia)
Piccadilly Circus
Knightsbridge
Barons Court
Gloucester Road
Sloane Square
St. James's Park
West Kensington
Earl's Court
South Kensington
Victoria
Westminster

Topology - Graphs

- Explicit relations between objects
- Graph representation
- OGC : Node / edge / face
- TopoGeometry datatype
- SQL/MM support
- Sandro Santilli – Toscane Region





Recursive CTE

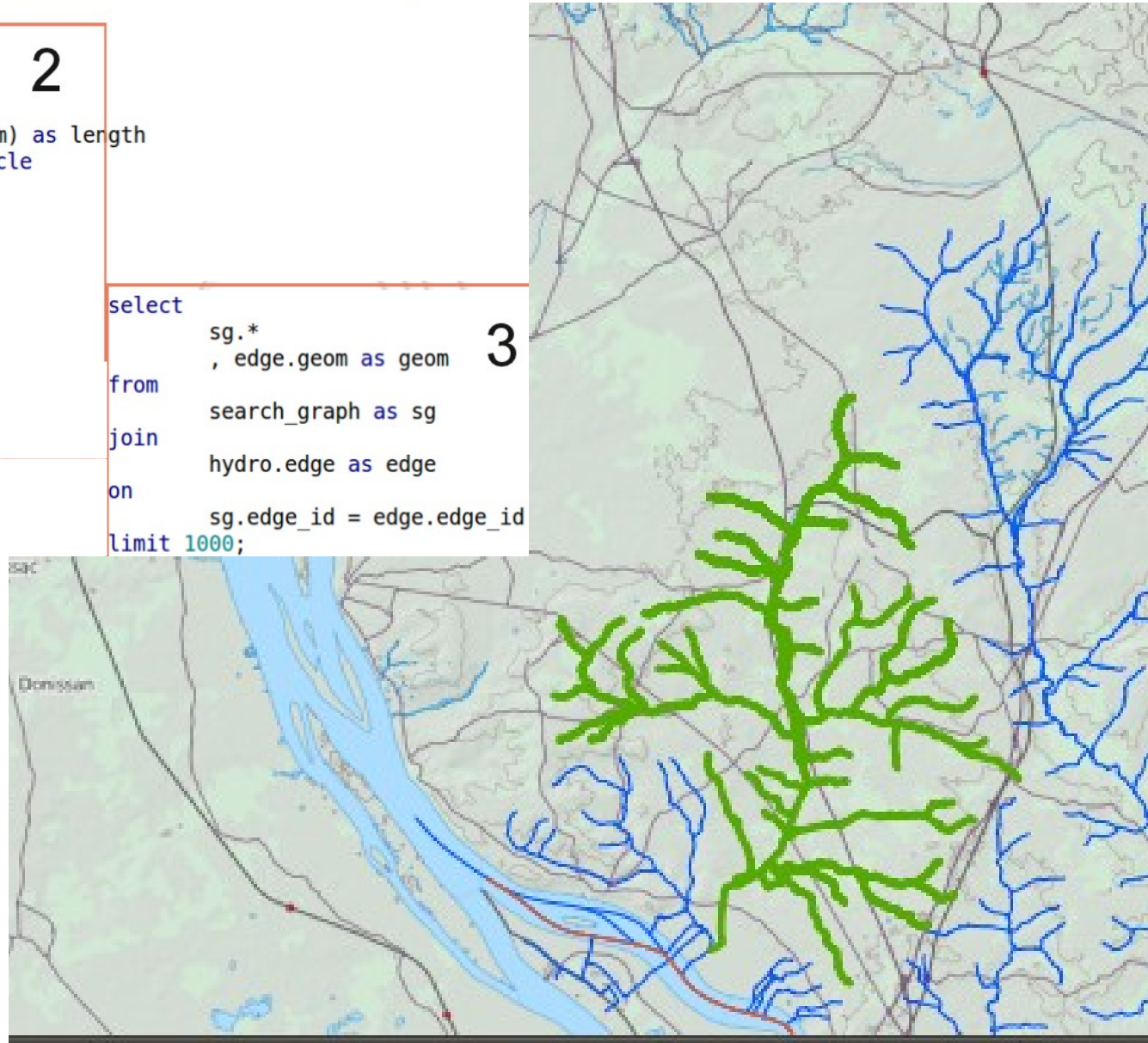
```
create table
        rec_res2 as
with recursive
        search_graph(edge_id, start_node, depth, path, length, cycle) as (
                select
                        g.edge_id, g.start_node, 1 as depth, ARRAY[g.edge_id] as path
                        , st_length(geom) as length, false as cycle
                from
                        hydro.edge as g
                where
                        edge_id = 173832
                union all
                select
                        g.edge_id
                        , g.start_node
                        , sg.depth + 1 as depth
                        , path || g.edge_id as path
                        , sg.length + st_length(g.geom) as length
                        , g.edge_id = ANY(path) as cycle
                from
                        hydro.edge as g
                join
                        search_graph as sg
                on
                        sg.start_node = g.end_node
                where
                        not cycle
                )
```

1

2

```
select
        sg.*
        , edge.geom as geom
from
        search_graph as sg
join
        hydro.edge as edge
on
        sg.edge_id = edge.edge_id
limit 1000;
```

3



Raster

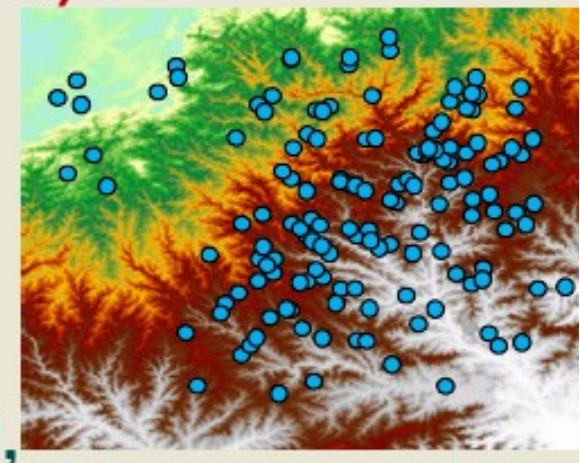
Rasters

- Raster / vector analysis
- New datatype
  - Looks like geometry
  - But for rasters
- Multiresolution, multiband, tile coverage
- Import/export (GDAL)
- Functions
  - Statistics, reprojection, edit, compute
  - Vector/raster functions
  - More & more functions & faster

Rasters

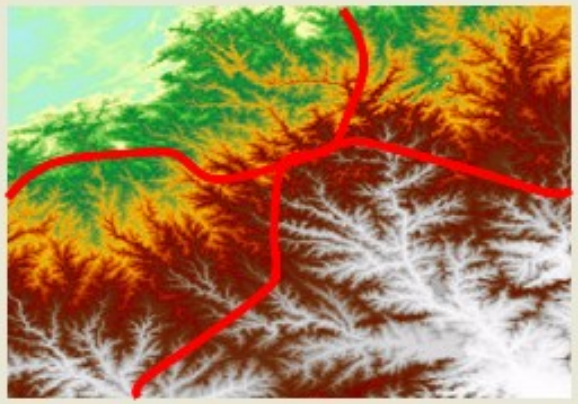
Extract ground elevation values for lidar points…

- SELECT pointID, ST_Value(rast, geom) elevation
  FROM lidar, srtm WHERE ST_Intersects(geom, rast)



Intersect a road network to extract elevation values for each road segment

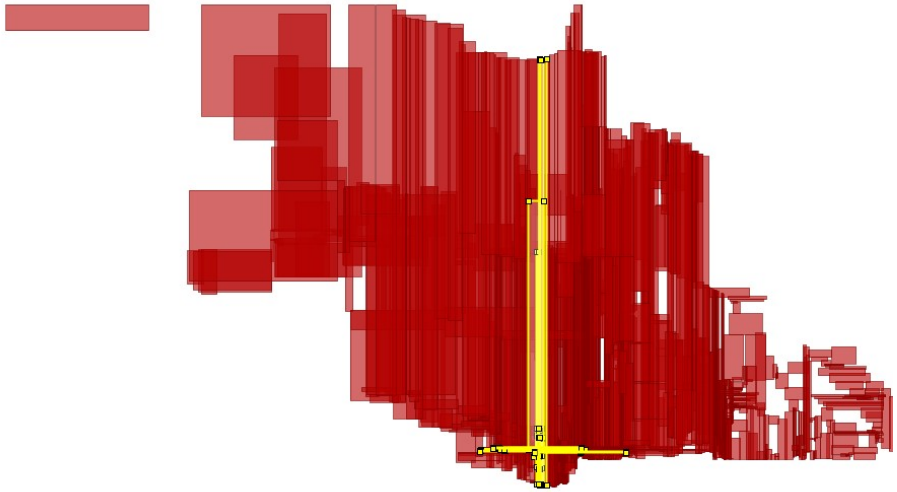
- SELECT roadID,
  (ST_Intersection(geom, rast)).geom road,
  (ST_Intersection(geom, rast)).val elevation
  FROM roadNetwork, srtm WHERE ST_Intersects(geom, rast)

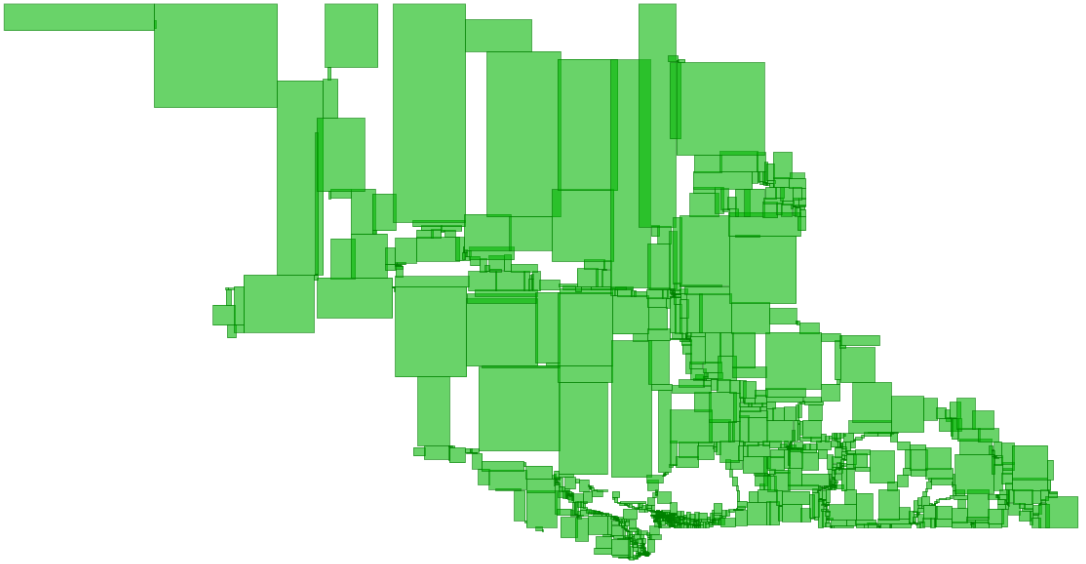


Indexing

Indexing - pick-split

- #define KOROTKOV_SPLIT 1
- « Double sorting-based node splitting algorithm for R-tree »
- Huh ?
- → Better bbox organization in indexes





(Suggestion of presentation)

KNN-Search

- KNN-GIST search in PostgreSQL 9.1+
- Use indexes !
- Spatial nearest neighbors

```
SELECT name, gid FROM geonames
ORDER BY
   geom <-> st_setsrid(st_makepoint(-90,40),4326)
LIMIT 10;
```

- Distance operator
  - <-> or <#> : center or bbox
  - Need to refine for non-point geometries

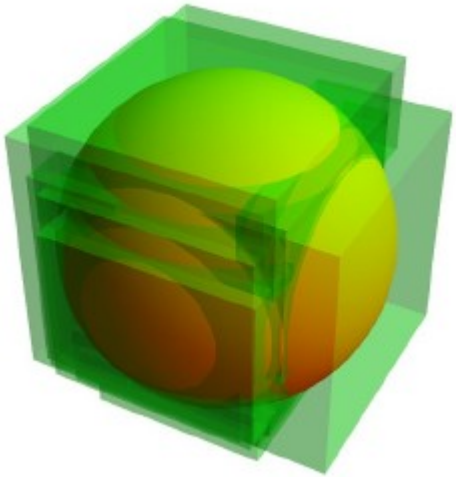
SP-Gist

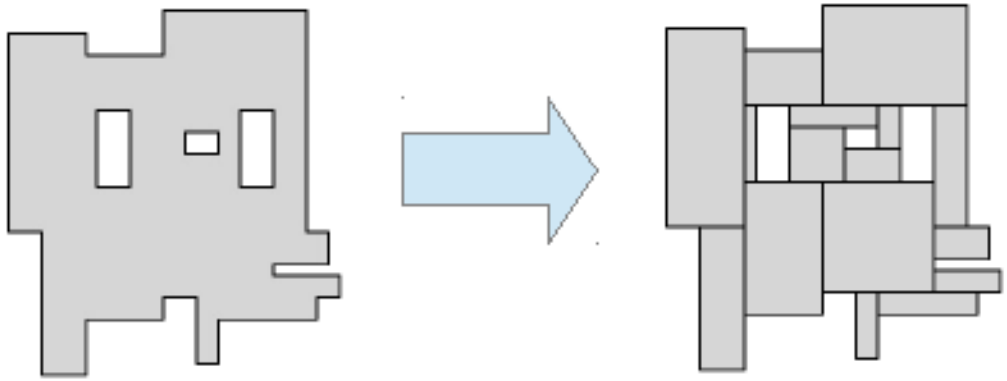
- « SP » = SPatial
- New PG index type
- Faster to read
- 3x faster to build
- Good fit for spatial data
- GSoC 2014
- OK for points, not for other geometries

VODKA

- Korotkov, Bartunov, Sigaev
- create index .. using vodka
- Derivation of JSONB indexing
- R-Tree based on GiST as entry tree
- Use multiple boxes per polygons

WIP





Beware of the spaghetti monster killing your R-Trees !

Geocoding

PAGC in PostGIS

- Address standardizer as PG extension

- standardizer → PostGIS project
- Soon replace TIGER parts
- Later work on Next gen. Geocoder
  - European addressing
  - …
  - Collaboration with PAGC team
- Stephen Woodbridge & Regina Obe

3D

PostGIS 3D / SFCGAL

SFCGAL

=

CGAL

+

CERTIFIED OGC® COMPLIANT

ISO 19107:2013

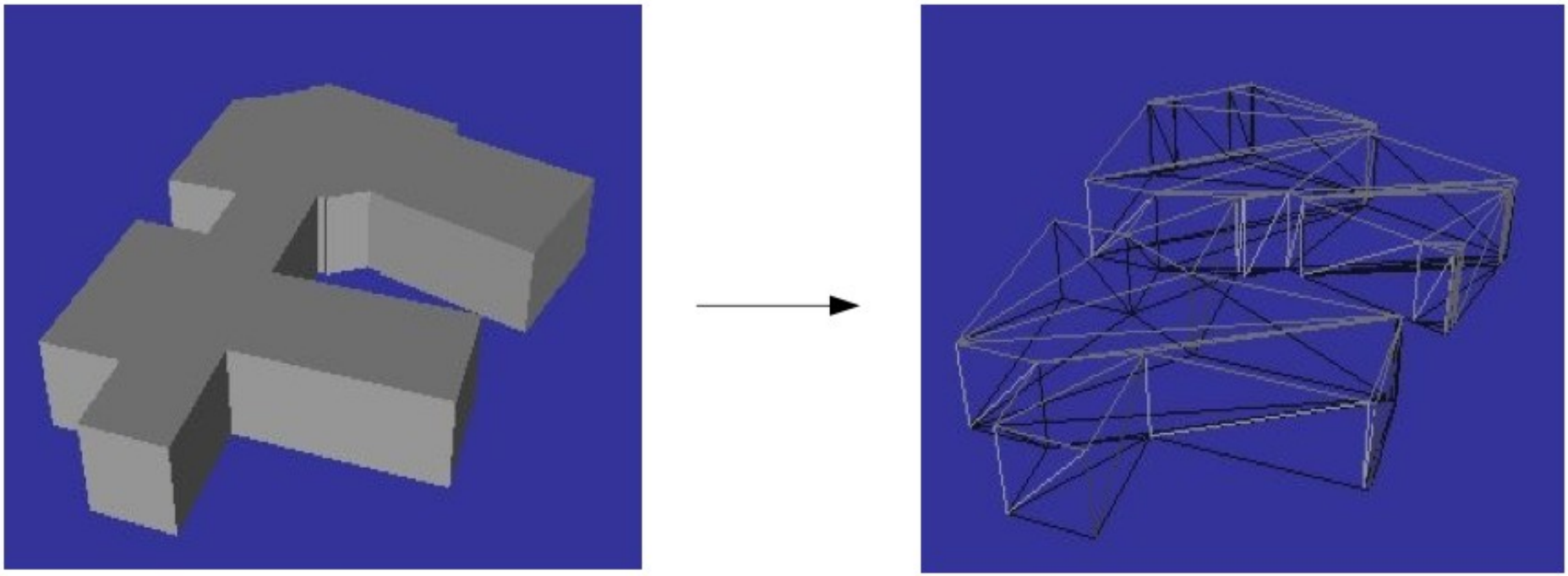
ISO 19125:2013

CGAL

SFCGAL functions

- ST_3DIntersection
- ST_Tesselate
- ST_3DArea
- ST_Volume
- ST_3DUnion
- ST_3DDifference
- ST_Extrude
- ST_ForceLHR
- ST_Orientation
- ST_MinkowskiSum
- ST_StraightSkeleton

ST_Tesselate



ST_StraightSkeleton

2D Building Footprint

Straight Skeleton

Extrusion & roof computation

SFCGAL news

- create extension sfcgal ;
- Windows binaries
- Some more functions

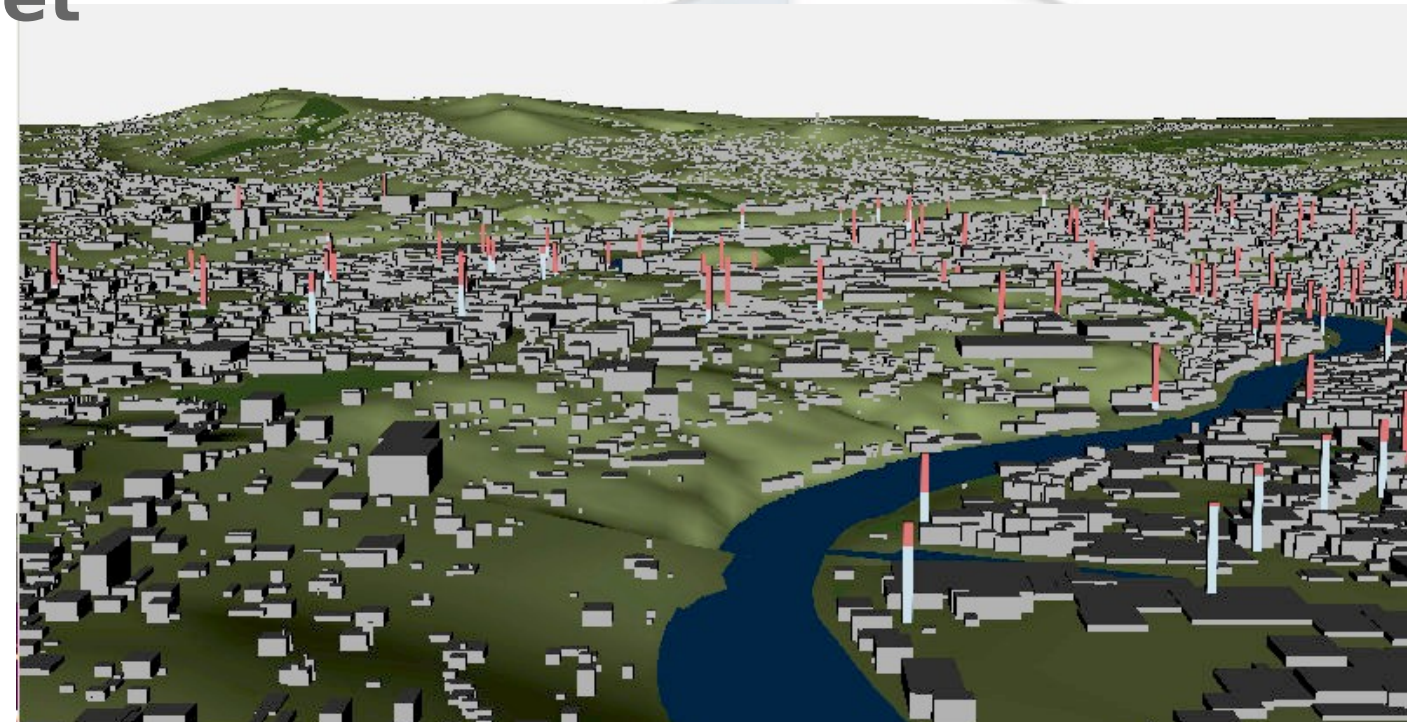
- CI integration (regress, unit)
- Texture support
- More import/export, « GeoJSON 3D », CityGML

```
SET postgis.backend = 'geos' ;
```

```
SET postgis.backend = 'sfcgal' ;
```

Viewer : Horao

- OpenSceneGraph-based
- Independant + QGIS plugin
- Synchronization with QGIS
- MNT, 3D, custom queries
- www.horao.net



Viewer : Cuardo

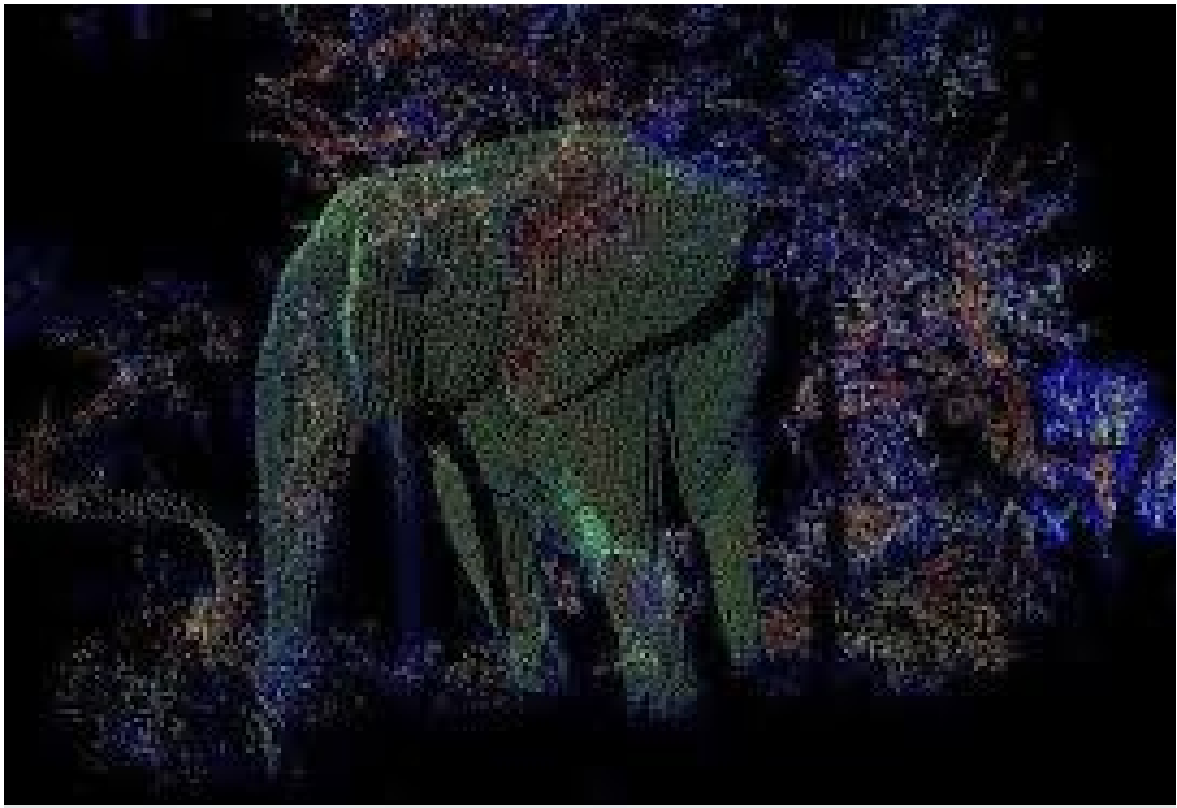
- Full WebGL viewer
- Mixed 2D/3D viewer/generator
- Using Three.js power
- GIS server with 3D webservices
- PostGIS companion
- 3D GIS Stack

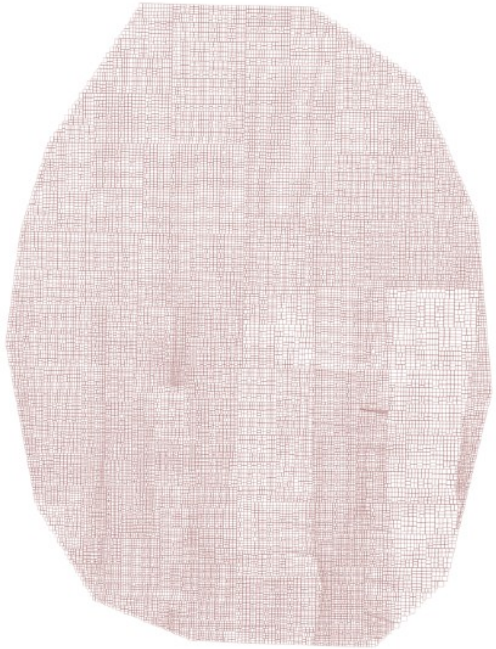
PointCloud

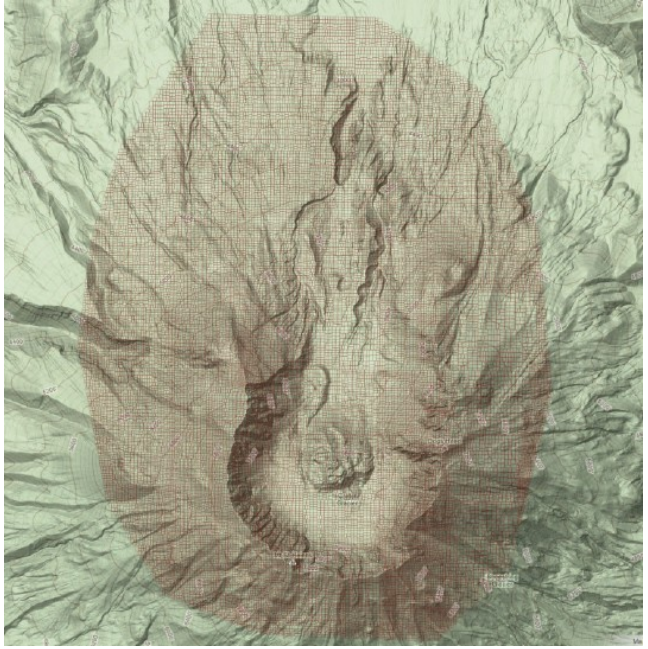
PointCloud

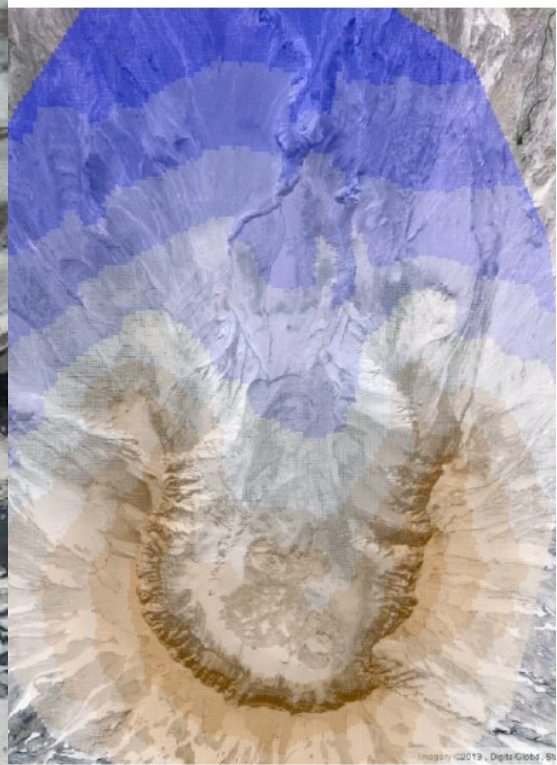
- PostgreSQL extension + PostGIS
- Paul Ramsey – Natural resources Canada
- LIDAR - Huge point datasets
- N-Dimensional
- PDAL I/O

- Point patches
- Indexes
- Functions









Try it out

docker-pggis

- Docker container for latest database GIS stuff
- Latest versions
  - PG 9.4
  - PostGIS 2.1.4 + SFCGAL
  - PointCloud master
  - PDAL
- Run everything in two lines
- Based on phusion baseimage
- Not for production !

https://github.com/vpicavet/docker-pggis


```
docker build -t oslandia/pggis .
docker run --rm -P --name pggis_test oslandia/pggis
```

Oracle FDW

oracle_fdw

- FDW for Oracle database (Laurenz Albe)
- NEW : Oracle Spatial support (Vincent Mora)
- Native, R+W, Fast !
- Points, lines & polygons
- Combine with Materialized V.

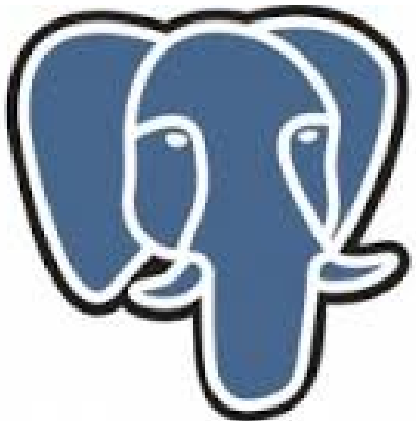
- Heterogeneous systems
- Migration

- ora2pg support

PG 9.x

PG → PostGIS

- PG improvements → PostGIS benefits :-)
- Some parts :
  - JSONB & GeoJSON
  - Multimaster logical replication
  - Postgres-XL (parallel PG)



What more ?

Other PostGIS stuff...

- Raster features
- Function interruptions in GEOS
- More formats
  - Vector tiles
  - ...
- 3D
  - More functions
  - Server-side services
- More functions

That's (almost) all

Thank them

Mark Cave-Ayland
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Bborie Park
Paul Ramsey
Sandro Santilli
Jorge Arévalo
Nicklas Avén
Olivier Courtin
Pierre Racine
David Zwarg
Chris Hodgson
Kevin Neufeld
Dave Blasby
Mateusz Loskot
Jeff Lounsbury
Mark Leslie
Stephen Woodbridge
Alex Bodnaru
Alex Mayrhofer
Andrea Peri
Andreas Forø Tollefsen
Andreas Neumann
Anne Ghisla
Barbara Phillipot
Ben Jubb
Bernhard Reiter
Brian Hamlin
Bruce Rindahl
Bruno Wolff III
Bryce L. Nordgren
Carl Anderson
Charlie Savage
Dane Springmeyer
David Skea
David Techer
Eduin Carrillo
Even Rouault
Frank Warmerdam
George Silva
Gerald Fenoy
Gino Lucrezi
Guillaume Lelarge
Hugo Mercier
IIDA Tetsushi
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Llari
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Klaus Foerster
Kris Jurka
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Mark Sondheim
Markus Schaber
Maxime Guillaud
Maxime van Noppen
Michael Fuhr
Nathan Wagner
Nathaniel Clay
Nikita Shulga
Norman Vine
Rafal Magda
Ralph Mason
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Silvio Grosso
Steffen Macke
Stephen Frost
Tom van Tilburg
Vincent Mora
Vincent Picavet
All PostgreSQL developers
All sponsors
People I forgot (sorry)

Thank you

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