



PostGIS 2.0 ...

... and beyond

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https://github.com/Oslandia/presentations/tree/master/pgconf_eu_2012

PostGIS 2.0

PostGIS 2.0.0 : April 3, 2012

After 26 months !

Major version

Breaks compatibility

Loads of new features

Performance
improvement





What's new ?



Internals

New serialization format

New geometry types (3D)

Fix 2D only bounding boxes

Fix bytes alignment

New parsers

WKB

WKT

Features

Management functions
ISO SQL/MM compliancy
New functions for analysis
Topology (SQL/MM)
Real 3D storage
Raster / geometry functions
KNN indexed search
TIGER (geocoder / reverse...)

Install

Easier installation (PG \geq 9.1)

```
CREATE EXTENSION postgis ;
```

```
CREATE EXTENSION postgis_topology ;
```



Manage

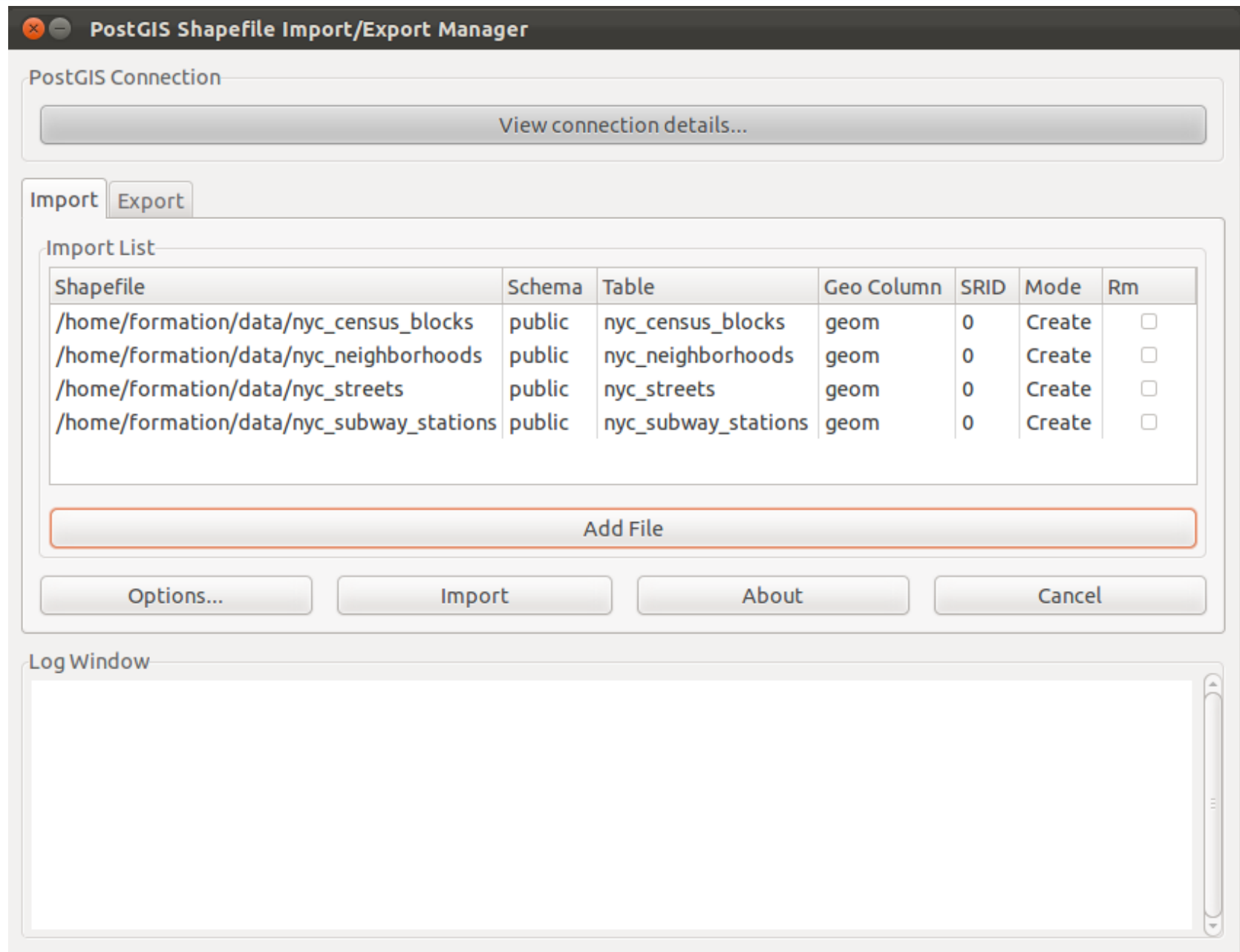
geometry_columns → view

Typmod usage

Old way still available

```
CREATE TABLE buildings (  
    gid SERIAL PRIMARY KEY  
    , geom geometry(MultiPolygon, 26986)  
);  
  
alter table buildings  
    alter column geom  
        type geometry(MultiLineString, 2154)  
        using st_setsrid(geom, 2154);
```

Load



Functions

ST_ConcaveHull

ST_Snap

ST_Split

ST_MakeValid

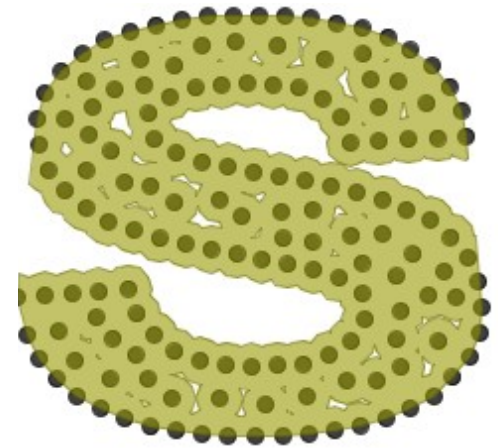
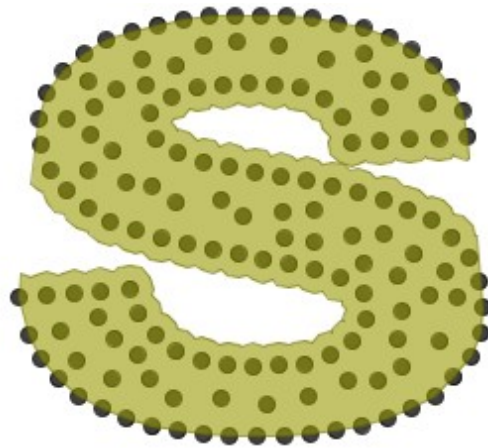
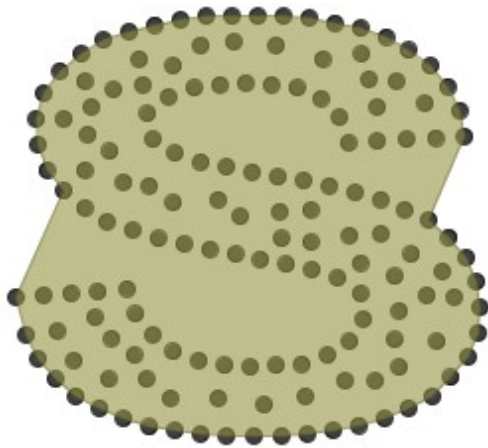
ST_IsValidDetail

ST_OffsetCurve

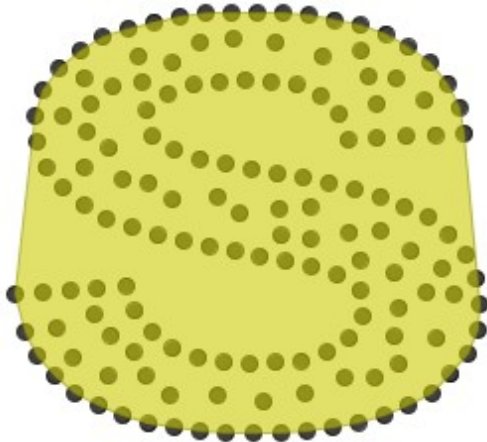
...



hulls and curves



Concave hulls with various settings



Convex hull



Offset curves

cleaning data

Before : ST_Buffer(the_geom, 0)

After :

ST_MakeValid()

ST_RemoveRepeatedPoints()

ST_IsValidReason()

ST_IsValidDetail()

```
SELECT ST_IsValid(geom),ST_IsValidReason(geom) FROM
(SELECT ST_GeomFromText('POLYGON ((0 0, 0 10, 10 10, 10 0, 0 0),(20 20, 20 30, 30 30, 30 20, 20 20))') as geom) as foo;
st_isvalid|          st_isvalidreason
```

```
-----+-----
f      | Hole lies outside shell at or near point (20.0, 20.0, NaN)
```

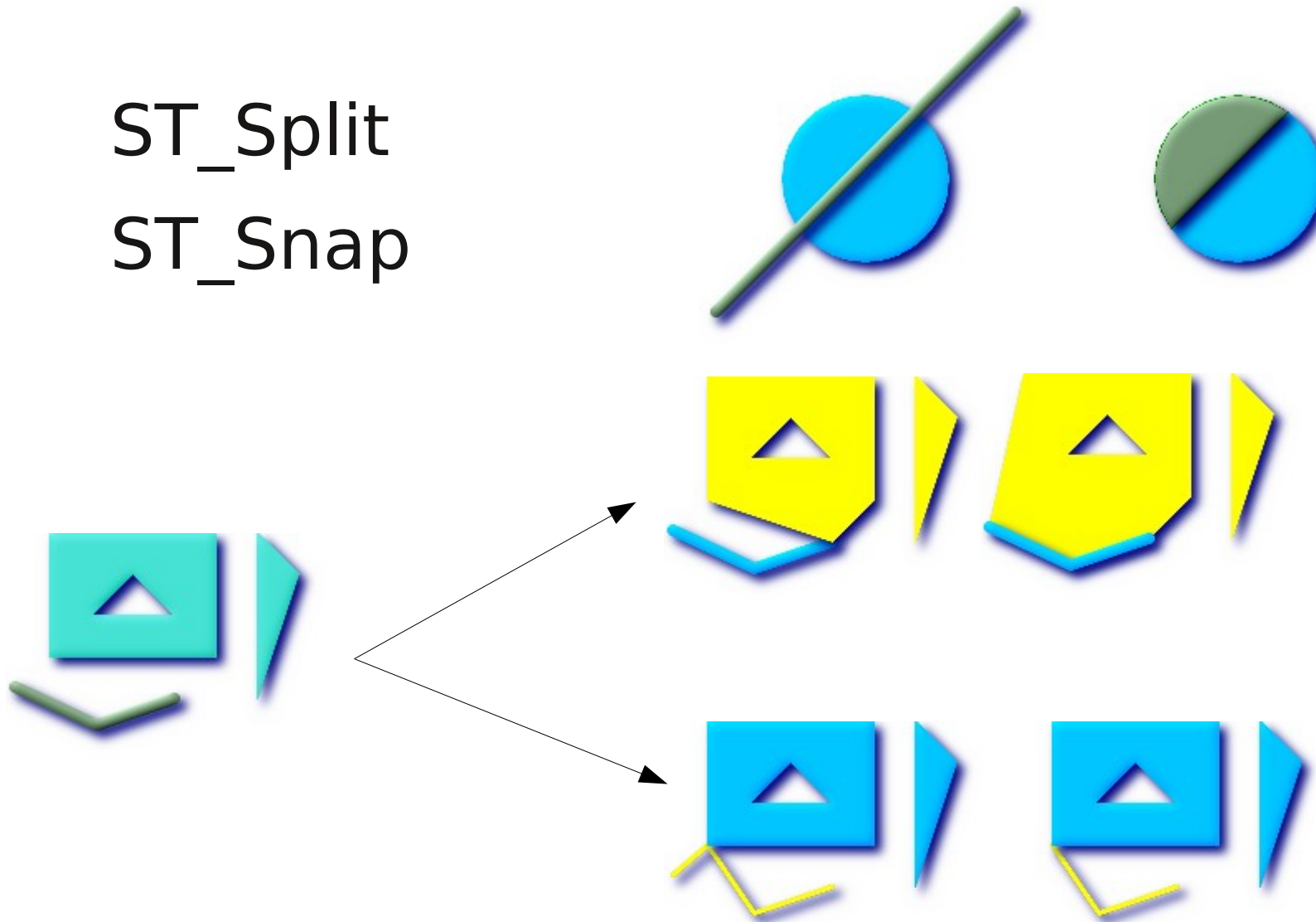
```
SELECT * FROM ST_IsValidDetail('LINESTRING(...)');
```

```
gid |      reason      | location
-----+-----
5330 | Self-intersection | POINT(32 5)
```

Splitting and snapping

ST_Split

ST_Snap



Real 3D

«real» 3D inside PostGIS

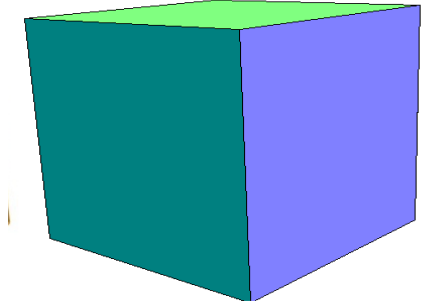
ISO and OGC standards

ISO 19125, SQL/MM, SFS 1.2.0

First step of implementation

New data types & functions

... Much more coming soon ...



New types :

TRIANGLE, POLYHEDRALSURFACE, TIN

New functions :

ST_3DDistance, ST_3DIntersects,
ST_3DDWithin, ST_3DClosestPoint...

Input/Output : ST_AsGML, ST_AsX3D...

New operators

&&&

Spatial index : nd-indexes

TIGER

Geocoder

Reverse geocoder

TIGER to PostGIS topology loader

Updated loader



Topology



Beware of the spaghetti monster !

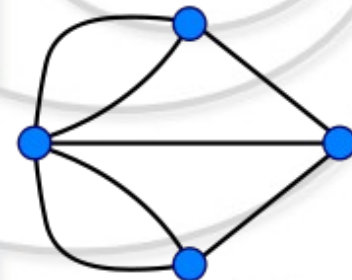
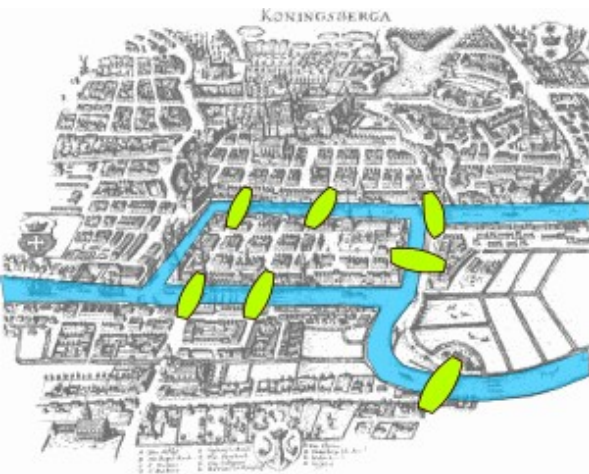
Topology - Graphs

Explicit relations between objects

Graph representation

Various models

OGC : Node / edge / face



Topology

Node/Edge/Face model

TopoGeometry Datatype

Use schemas

«topology» for functions and others

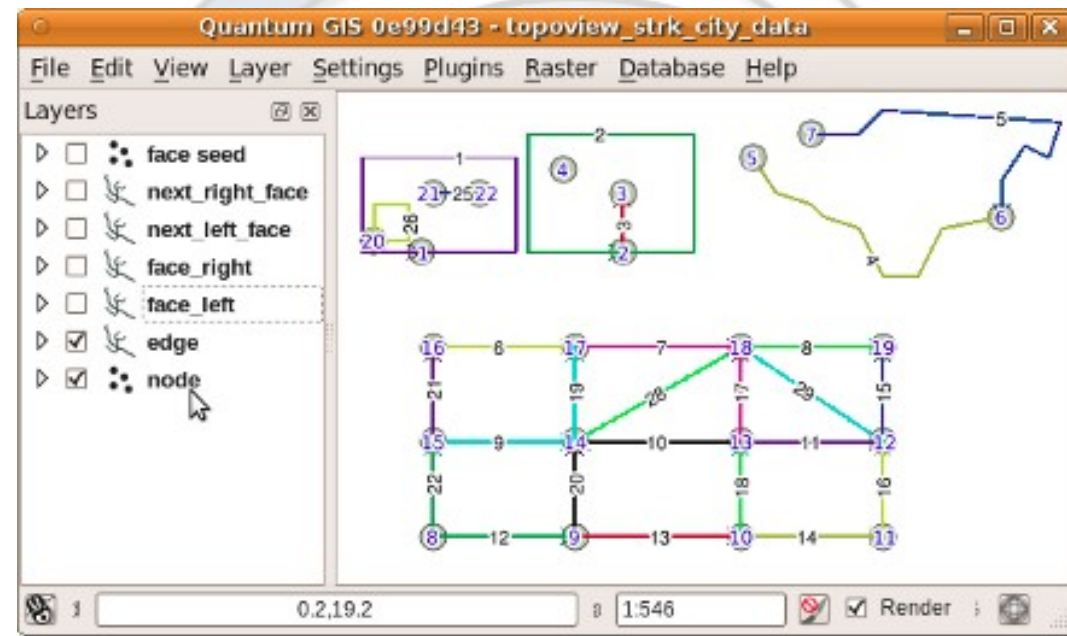
Each topology in its own schema

Full SQL/MM topology support

Integrated in 2.0

Sandro Santilli

Toscane Region



PostGIS Raster

Raster / vector analysis

New datatype

- Looks like geometry

- But for rasters

Multiresolution, multiband, tile coverage

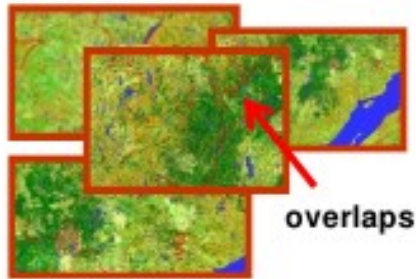
Import/export (GDAL)

Functions

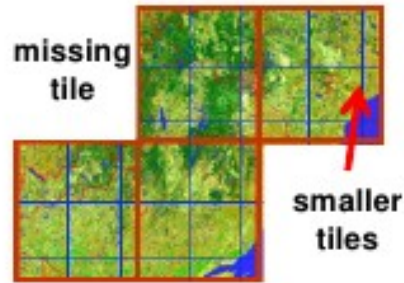
- Statistics, reprojection, edit, compute

- Vector/raster functions

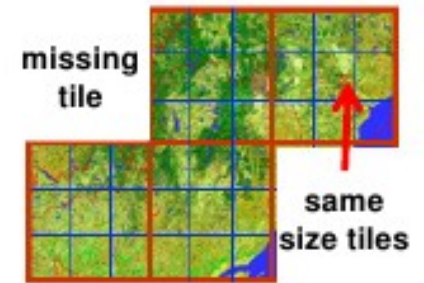
PostGIS Raster



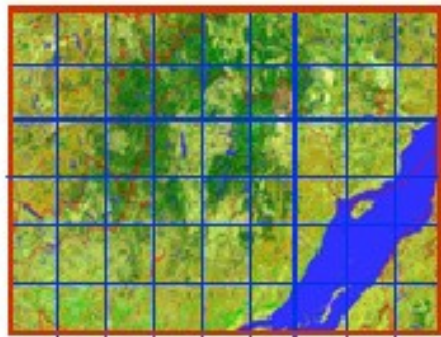
a) warehouse of untiled and unrelated images (4 images)



b) irregularly tiled raster coverage (36 tiles)



c) regularly tiled raster coverage (36 tiles)



d) rectangular regularly tiled raster coverage (54 tiles)

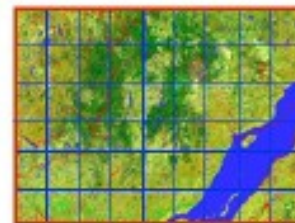


Table 1

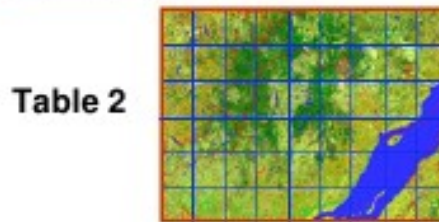
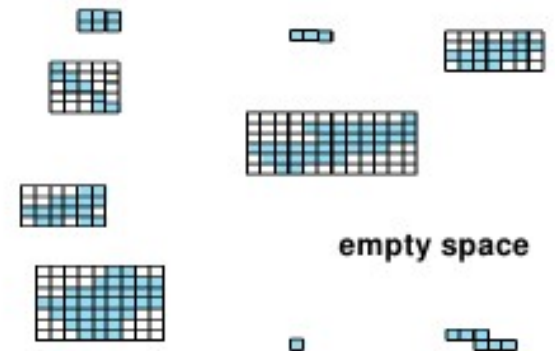


Table 2

e) tiled images (2 tables of 54 tiles)



f) rasterized geometries coverage (9 lines in the table)



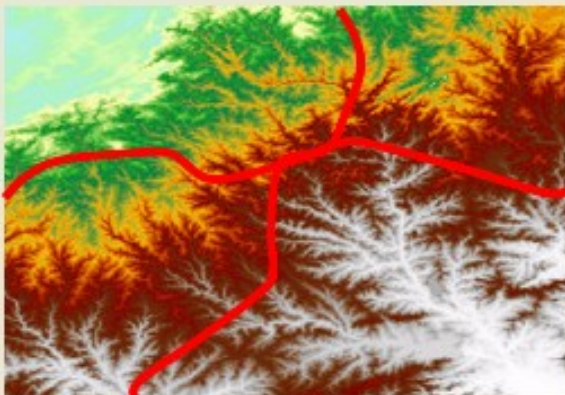
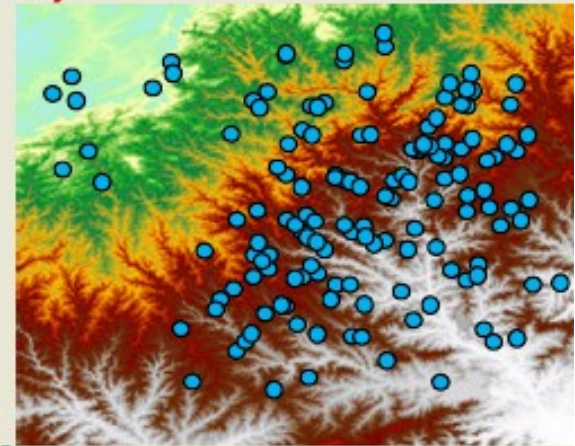
PostGIS 2.0 : PostGIS Raster

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)`



PostGIS 2.0 : nearest neighbours

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

PostGIS 2.1 ?



Currently under work :

Arc-geometry distance

Distance with cached tree

R-Tree index improvement (pick-split)

SP-Gist Index

New in PG 9.1

Up to 3x faster construction

Faster to read

PostGIS 2.1

Under work, raster part :

ST_MapAlgebra with n rasters

Complete St_SetValues

Bands to array function

Better « isnodata » management

Raster tiling

(proprietary) support in FME ETL

And more...

Topology improvement

Tiger geocoder as PG extension

PgRouting as PG extension

+ windows support

PostGIS 2.1

And even more...

Development platform improvement

Meet Debbie and Winnie !

Jenkins

search

log in | sign up

Jenkins

People

Build History

Build Queue

No builds in the queue.

Build Executor Status

#	Status
1	Idle
2	Idle
3	Idle
4	Idle

AllGDALGEOSPostGISPostgreSQL

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

PostGIS 2.1

```
[00:40] <debbie> Project PostGIS_2.0 build #34: SUCCESS in 9 min 21 sec: http://debbie.postgis.net:8080/job/PostGIS\_2.0/builds/34
[00:40] <debbie> Paul Ramsey: (#2026) fix performance regression in geography distance calculation
[00:40] <sigq> Title: PostGIS_2.0 #34 [Jenkins] (at debbie.postgis.net:8080)
[00:44] <pramsey> done!
[00:47] <debbie> Project PostGIS_2.1 build #227: SUCCESS in 26 min: http://debbie.postgis.net:8080/job/PostGIS\_2.1/builds/227
[00:47] <debbie> Paul Ramsey: (#2026) fix performance regression in geography distance calculation
[00:47] <sigq> Title: PostGIS_2.1 #227 [Jenkins] (at debbie.postgis.net:8080)
[00:51] --> tomkralidis a rejoint ce canal (~tomkralid@CPE0013ce450e14-CM001692413c80.cpe.net.cable.rogers.ca)
[00:51] <-- tomkralidis a quitté ce serveur (Changing host).
[00:51] --> tomkralidis a rejoint ce canal (~tomkralid@osgeo/member/tomkralidis).
[00:51] <debbie> Project PostGIS_2.1_docs build #145: FAILURE in 4 min 0 sec: http://debbie.postgis.net:8080/job/PostGIS\_2.1\_docs/builds/145
[00:51] <debbie> * Bborie Park: Added news and docs for ST_Tile(raster). Additional regression tests for
[00:51] <debbie> one additional variant of ST_Tile(raster)
[00:51] <sigq> Title: PostGIS_2.1_docs #145 [Jenkins] (at debbie.postgis.net:8080)
[00:51] <debbie> * Bborie Park: Added ST_Tile() and regression tests. The circle is complete.
[00:51] <debbie> * Bborie Park: Added rt_band_get_pixel_line() and regression tests
[00:51] <debbie> * Paul Ramsey: (#2063) fix the vertex-crossing logic in the circular tree code to use the new edge
[00:51] <debbie> * Paul Ramsey: (#2026) fix performance regression in geography distance calculation
[00:52] --> tbowden a rejoint ce canal (~tim@124-148-118-242.dyn.iinet.net.au).
[00:54] <-- epifanio a quitté ce serveur (Read error: Operation timed out).
[00:58] <winnie> Project PostGIS 2.1 mingW regress build #456: STILL FAILING in 2 min 30 sec: http://winnie.postgis.net:1500/job/PostGIS\_2.1\_mingW\_regress/builds/456
[00:58] <sigq> Title: PostGIS 2.1 mingW regress #456 [Jenkins] (at winnie.postgis.net:1500)
```

+ Hallie :
documentation bot (PostgreSQL FTS & more)

And beyond ?



PostGIS 3.0 ?

Paris codesprint and barcamp May 2012

Find directions for future

- Git, build system (mainly Windows)

- Geometry backend (GEOS vs BGL vs ?)

- Raster improvement

- 3D topology & processing (CGAL?)

- Point clouds

- Performance, performance, performance

Let's go 3D !



PostGIS 3D

2.5D already in
3D storage is in

We want analysis !

ST_3Dintersects

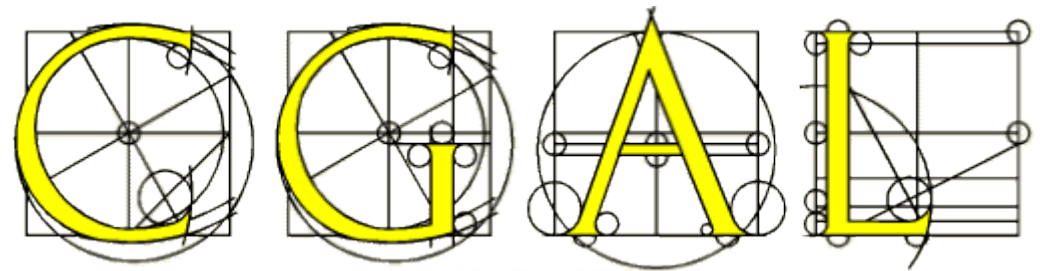
ST_3Dintersection

ST_extrude (2D → 3D)

ST_3Dconvexhull

ST_DelaunayTriangles...





2D & 3D geometric computation

C++

Exact computation

Efficient, generic, extensible...

...and now GPL !



PostGIS 3D

Some European funding
Cooperation with IGN & others

e-PLU

Creation of SFCGAL framework (OGC-SF)
Use it in PostGIS
Compare with GEOS (for 2D)

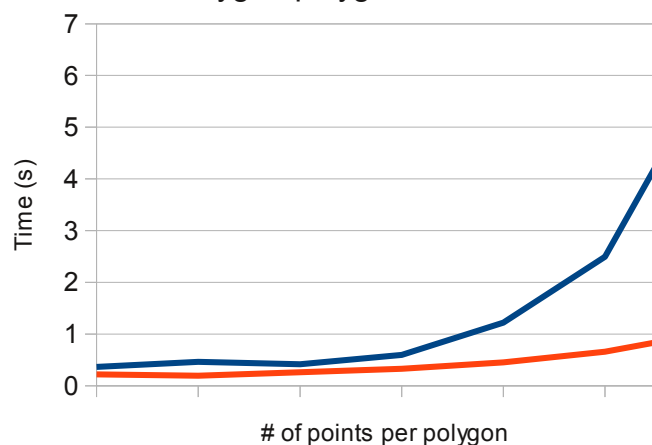


PostGIS 3D

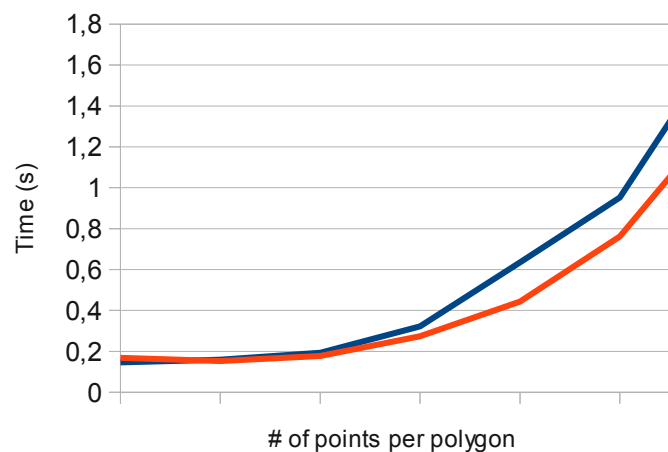
Most operations faster

Some operations to optimize

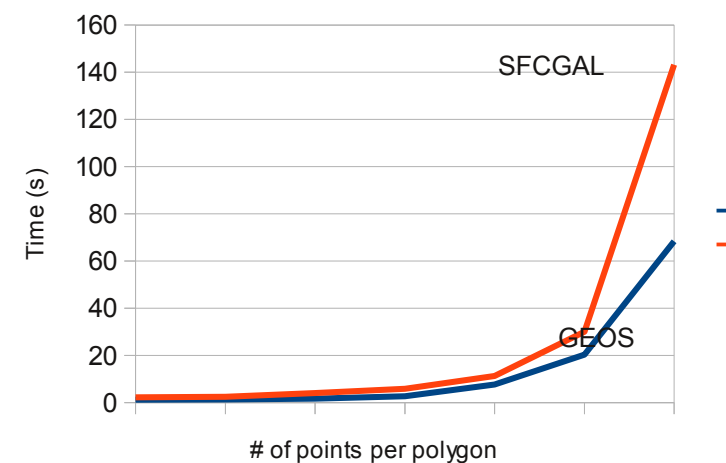
Polygon/polygon intersection



Convex hull



Linestring/polygon intersection



— GEOS
— SFCGAL

Issues

CGAL : exact predicates & constructions

PostGIS / GEOS : snap bounding (2D)

```
SELECT
  ST_Intersects(
    ST_Intersection(
      'LINESTRING(0 0,2 1)::geometry',
      'LINESTRING(1 0,0 1)::geometry',
      'LINESTRING(0 0,2 1)::geometry');
  st_intersects
-----
f
(1 row)
```

Way to pass CGAL object references ?

(very) Recent progress

Quantum GIS client (Globe)

Some analysis functions

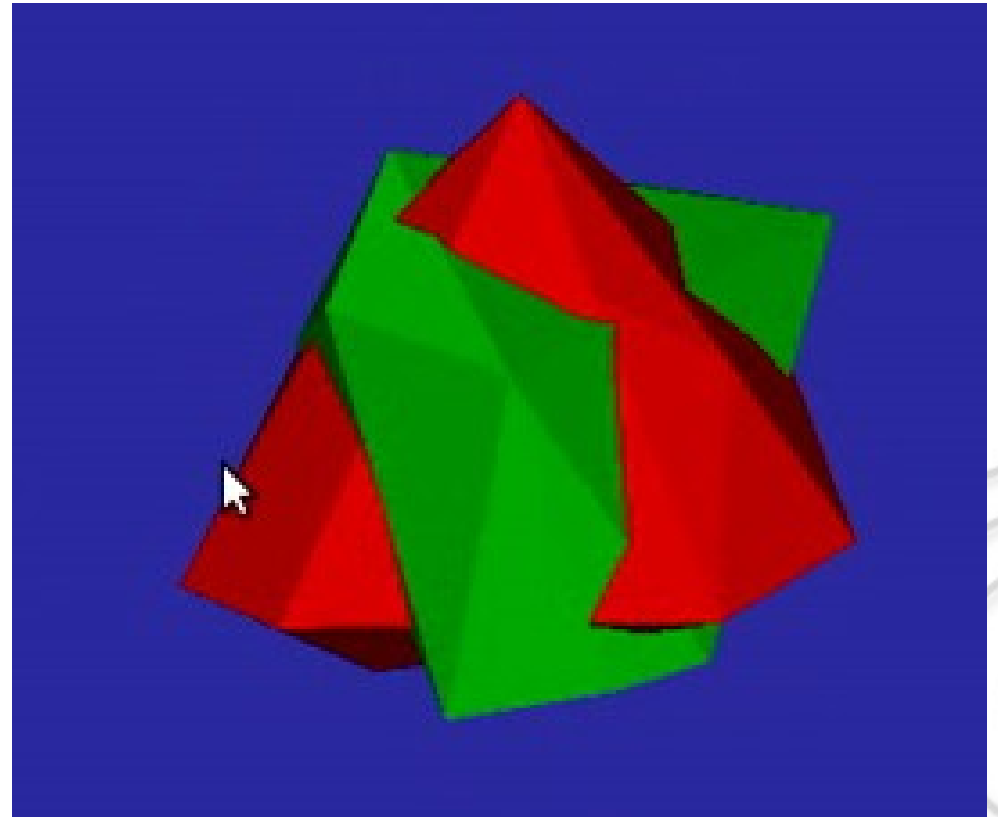
ST_Extrude

ST_3DConvexhull

ST_3DIntersection

Surfaces

Solids



Want to see ?



3D Next steps

Debug

More features from CGAL

Better QGIS support

CityGML & Collada loaders / exporters

PostGIS core integration

To be discussed at Boston codesprint 2013

TinyOWS for 3D webservices

Find €€€€€ to speed up development

That's it...

Feedback

<http://2012.pgconf.eu/feedback>

Questions ?

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