PostGIS 2.0 : Geodatabase Revolution

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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 ?

- **New serialization format**

  - New geometry types (3D)

  - Fix 2D only bounding boxes

  - Fix bytes alignment

- **New parsers**

  - WKB

  - WKT

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Features

- Management fonctions

- ISO SQL/MM compliancy

- New functions for analysis

- Topology (SQL/MM)

- Real 3D

- Raster / geometry functions

- KNN indexed search

- TIGER (geocoder / reverse...)

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- Easier installation (PG >= 9.1)
- CREATE EXTENSION postgis_core ;
- CREATE EXTENSION postgis_raster ;
- CREATE EXTENSION postgis_topology ;

- 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);
```
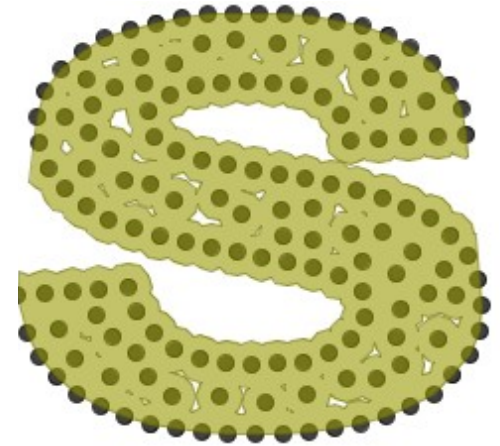
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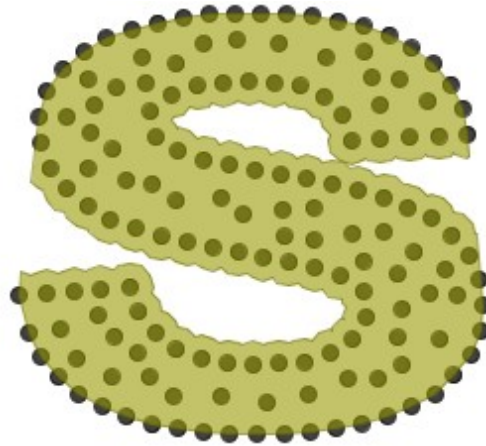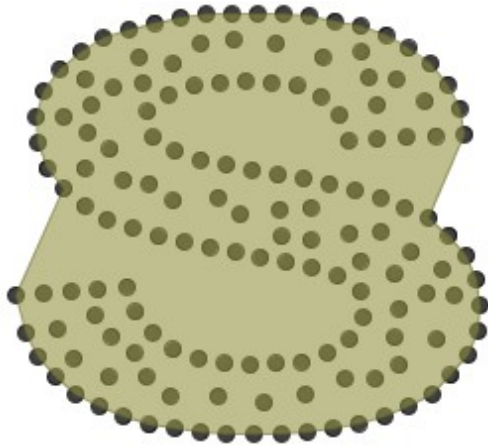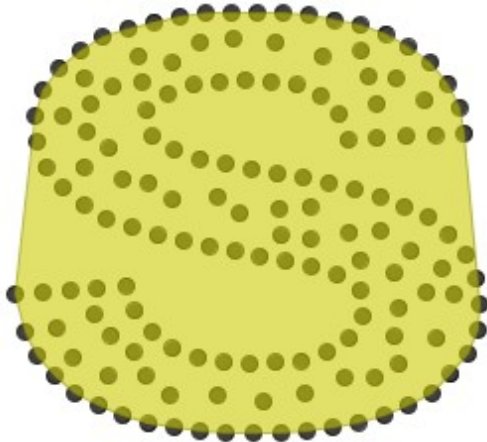# Load

- ST_ConcaveHull
- ST_Snap
- ST_Split
- ST_MakeValid
- ST_IsValidDetail
- ST_OffsetCurve
- ...

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Concave hulls with various settings

Convex hull

Offset curves

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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)
```
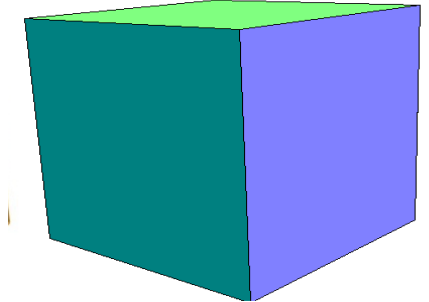
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Splitting and snapping

- ST_Split
- ST_Snap
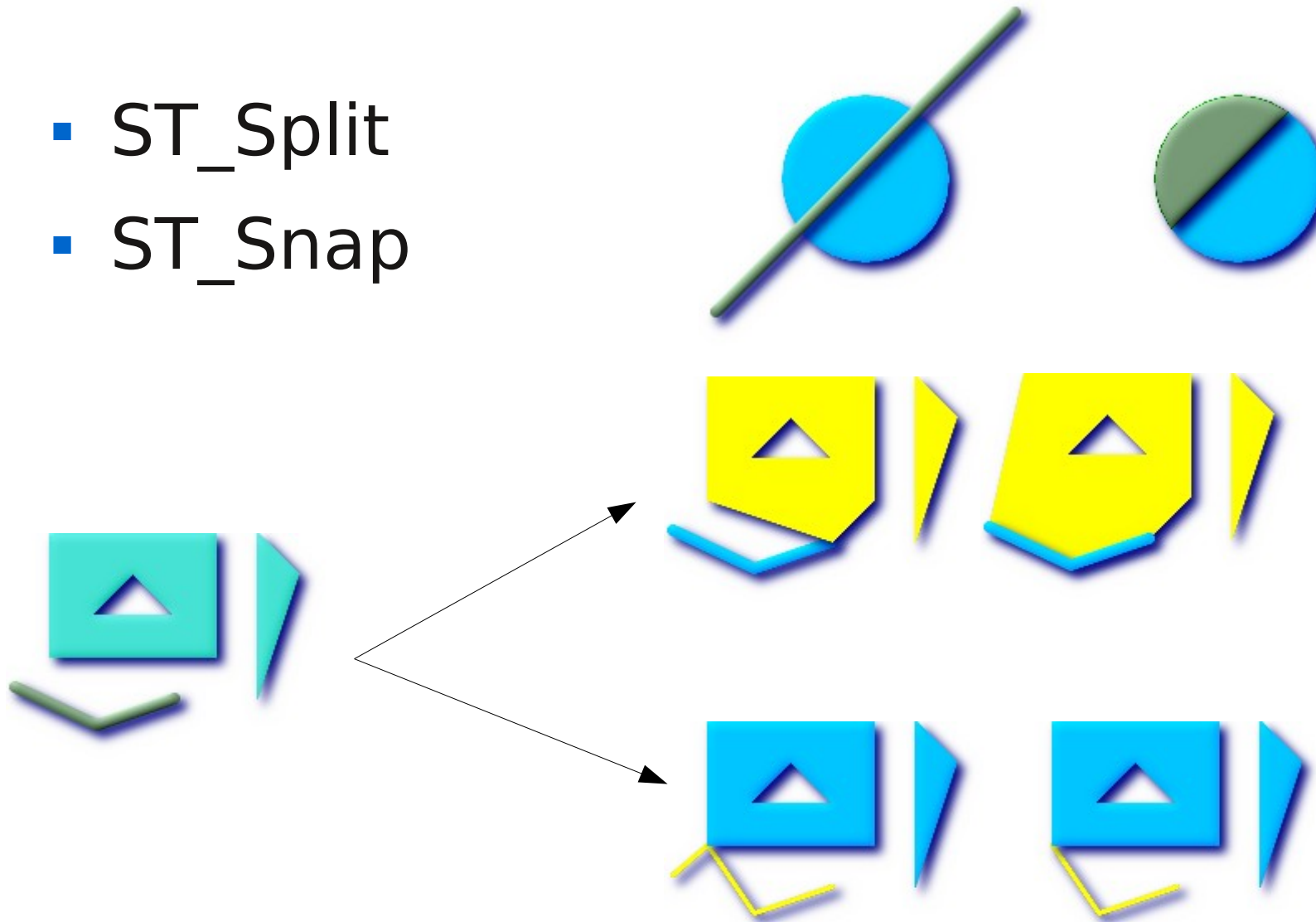
Real 3D

- «real» 3D inside PostGIS
- ISO and OGC standards
  - ISO 19125, SQL/MM, SFS 1.2.0
- First step of implementation
- New data types & functions

3D

- New types :
  - TRIANGLE, POLYHEDRALSURFACE, TIN
- New functions :
  - ST_3DDistance, ST_3DIntersects, ST_3DDWithin, ST_3DClosestPoint...
  - Input/Output : ST_AsGML, ST_AsX3D...
- New operators
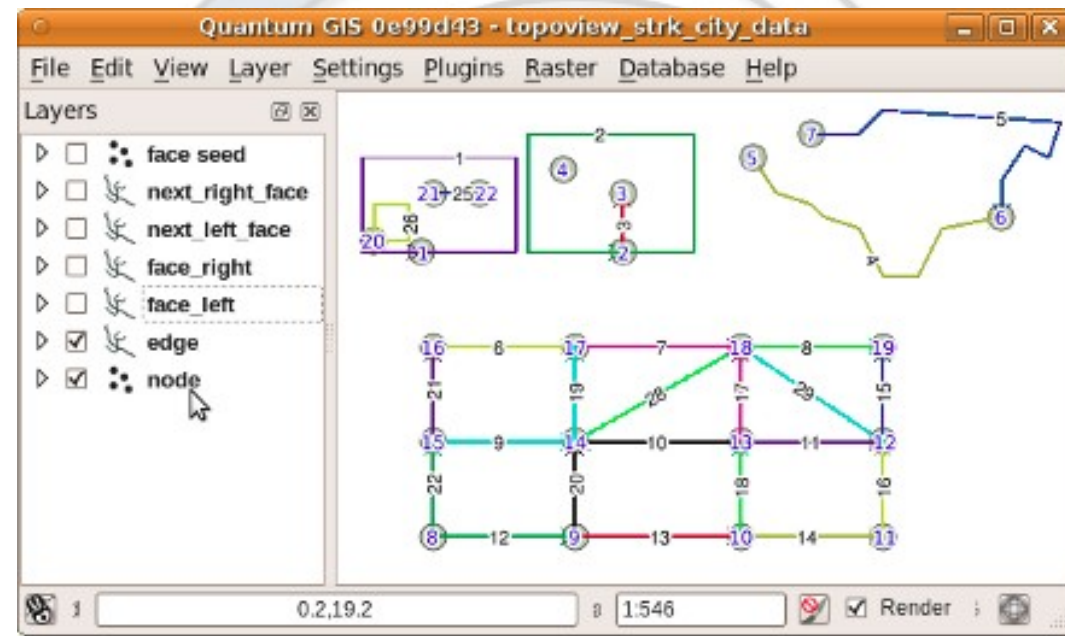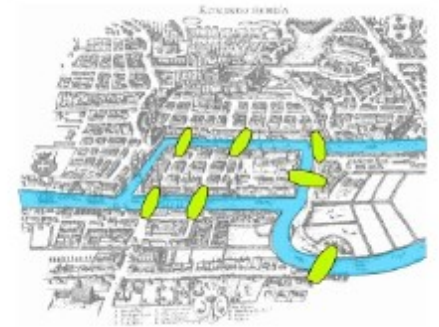 - &&&
- Spatial index : nd-indexes

- Geocoder

- Reverse geocoder

- TIGER to PostGIS topology loader

- Updated loader

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

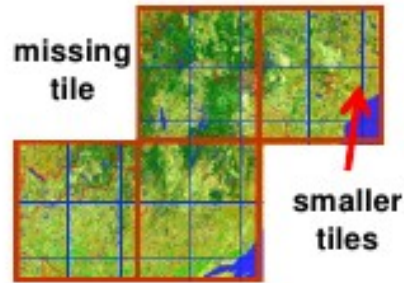 - Sandro Santilli

  - 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

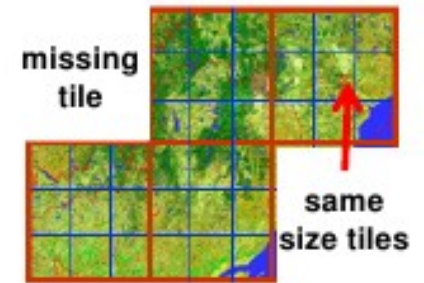 - Vector/raster functions

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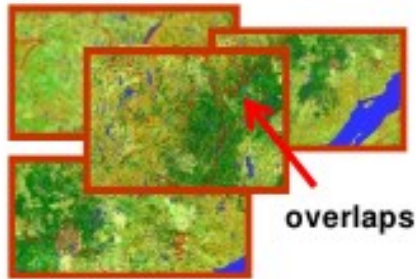
a) warehouse of untiled and unrelated images (4 images)

b) irregularly tiled raster coverage (36 tiles)

c) regularly tiled raster coverage (36 tiles)
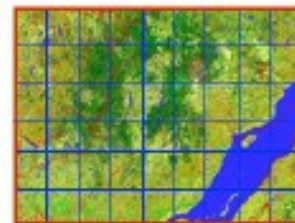
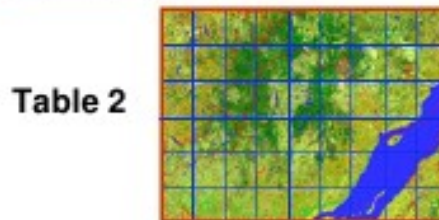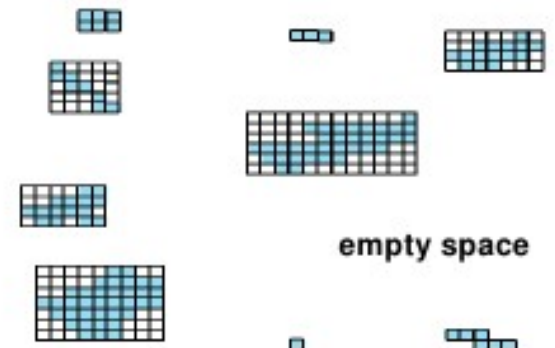d) rectangular regularly tiled raster coverage (54 tiles)

e) tiled images (2 tables of 54 tiles)

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

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)
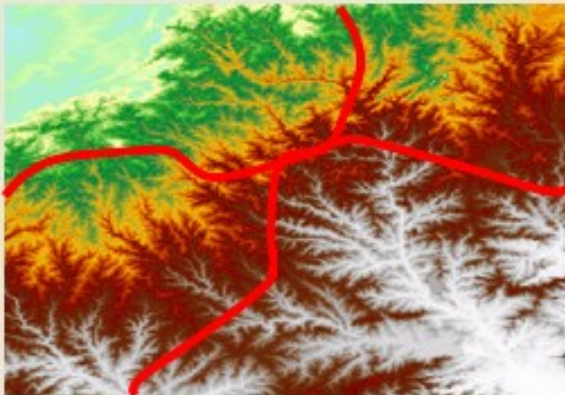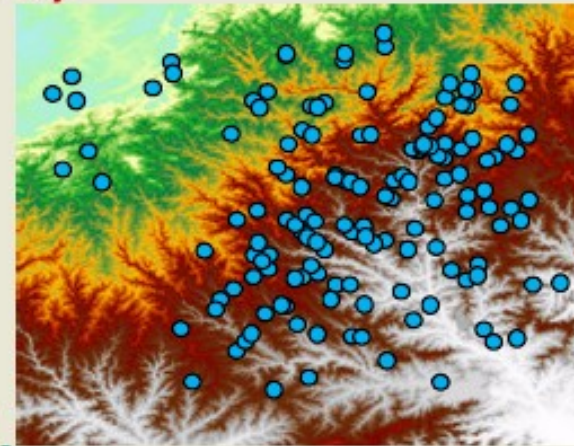
PostGIS 2.0 : nearest neighbours

- 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

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- PostgreSQL 9.2 → SP-Gist

  - SP means Spatial !

  - Quicker to create (up to 3x) quicker to read

  - → PostGIS 2.1

- Usual suspects

  - Raster, topology, 3D

  - Various new functions

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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

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- Range type

- JSON document storage (~Mongo in PG)

- Index-only scans

- Cascading, Multi-master replication

- Performances

  - Multicore read & write

  - Parallel bulk load

- FDW

- GPU

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That's it...

Questions ?

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