The State of PostGIS

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GeoExt

Open Layers

OpenGeo

GeoServer

GeoWebCache

PostGIS
Spatial Database?
Database

- **Types**
  - string, float, date

- **Indexes**
  - b-tree, hash

- **Functions**
  - `strlen(string)`, `pow(float, float)`, `now()`
Spatial Types
- geometry, geography

Spatial Indexes
- r-tree, quad-tree, kd-tree

Spatial Functions
- ST_Length(geometry), ST_X(geometry)
Open Geospatial Consortium (OGC)

Simple Features for SQL (SFSQL)
Diagram showing the geometric operations between two shapes A and B:

1. $A \cap B$ (Intersection of A and B)
2. $A \cup B$ (Union of A and B)
3. $A \setminus B$ (Difference of A and B)
4. $B \setminus A$ (Difference of B and A)
5. $A \Delta B$ (Symmetric Difference of A and B)

The shapes are visualized with different colors and outlines to represent the operations.
‣ Open Source (BSD)
‣ “Enterprise” Database
  ➤ ACID, hot backup, replication, partitioning
  ➤ triggers, constraints, foreign keys, user functions
  ➤ PL/PGSQL, PL/Perl, PL/TCL, PL/Java, PL/R

‣ Corporate support
  ➤ Enterprise DB
  ➤ Red Hat
What does PostGIS do?
“What parcels are within 1km of this fire?”
SELECT owner_phone
FROM parcels
WHERE ST_DWithin(
    geom,
    'POINT()',
    1000
);
“How far did the bus travel last week?”
SELECT Sum(ST_Length(geom))
FROM vehicle_paths
WHERE (v_id = 12)
AND (v_date > Now() - '7d');
History!
“Managing changing data in shape files is a pain in the _____!”
History!!!
More History!!!
“Why are these companies supporting PostGIS?”
DB Evaluation

- Can DB handle 100M spatial features?
- Can DB do spatial transactions?
- PostGIS? DB2? Oracle?
- Yes! Yes! Yes!
Transactional Maintenance

Check in edits

Check out working areas

PostGIS
Spatial PostgreSQL
## Scalability

<table>
<thead>
<tr>
<th>“Enterprise”</th>
<th>1 Dual-Core</th>
<th>2 Quad-Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle</td>
<td>$40,000</td>
<td>$160,000</td>
</tr>
<tr>
<td>IBM DB2</td>
<td>$36,400</td>
<td>$145,600</td>
</tr>
<tr>
<td>MS SQL Server</td>
<td>$25,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>IBM Informix</td>
<td>$50,000</td>
<td>$200,000</td>
</tr>
<tr>
<td>PostGIS</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>
What’s New?
PostGIS 1.4

- January 2009
- Prepared geometry
- Cascaded union
- Curves
- GeoJSON
Prepared geometry
Point in Polygon
Point in Polygon = $O(n)$
Line in Polygon = $O(n \cdot m)$
Build spatial index on edges!
Point-in-polygon == $O(\log(n))$
Line-in-polygon == $O(m \cdot \log(n))$

But,
Building an index takes $\Theta(n)$
Cache index and re-use it!
Prepared geometry makes repeated tests on large geometries very fast.
SELECT polygons
WHERE ST_Contains(
    polygons.geom,
    points.geom
)
Cascaded union
Cascaded union
Curves

- CURVESTRING
- COMPOUNDCURVE
- CURVEPOLYGON
ST_AsGeoJSON()

{"type":"LineString",
"coordinates":
[[0,0],[1,1]]}

http://geojson.org
PostGIS 1.5

- February 2010
- Geography type
- GUI shape file loader
- Faster distance calculation
- KML/GML format readers
ST_AsGeoJSON()
ST_AsGML()
ST_AsKML()
ST_GeomFromGML()
ST_GeomFromKML()
Who is geography for?

GeoNewbies

“I want to find all the address points within one mile. My data is in lat/lon. Google Maps rocks.”
Who is geography for?

“Yeah, I own a freaking satellite, you got a problem with that?”

GeoHugies

[Logos: NASA, NOAA, Geospatial-Intelligence, United States Navy]
Geography functions?

- Indexes spherical data
- ST_Intersects()
- ST_Distance()
- ST_DWithin()
- ST_Area()
- **Casts** to/from GEOMETRY
shp2pgsql -D -s 4326 \
-i \
countries.shp \
countries \
| psql -U pramsey \
-d geodatabase
PostGIS 2.0

- **December 2010**
- "typmod" support
- Raster support (see other talks!)
- 3D objects (polyhedra, TIN)
- New index support
  - 3D, 4D, Nearest-neighbor (PgSQL 9.1)
- **Breaking changes!! (yay!)**
geometry_columns
```sql
CREATE TABLE my_spatial_table
(
    id INTEGER,
    name VARCHAR
);
```
SELECT AddGeometryColumn('my_schema', 'my_geospatial_table', 'the_geom', 26910, 'POINT', 2);
<table>
<thead>
<tr>
<th>id</th>
<th>name</th>
<th>geo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>GEOMETRY(Point,26910)</td>
</tr>
</tbody>
</table>
Thanks!
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