



# The State of PostGIS

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GEOEXT



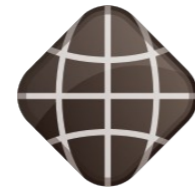
*OpenLayers*



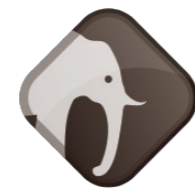
OPENGEO



GEO SERVER



GEO WEB CACHE



POSTGIS

# Spatial Database?

# Database

- ▶ **Types**

- ▶ string, float, date

- ▶ **Indexes**

- ▶ b-tree, hash

- ▶ **Functions**

- ▶ strlen(string), pow(float, float),  
now()

# SPATIAL

# Database

- ▶ **Spatial Types**

- ▶ geometry, geography

# Se

- ▶ **Spatial Indexes**

- ▶ r-tree, quad-tree, kd-tree

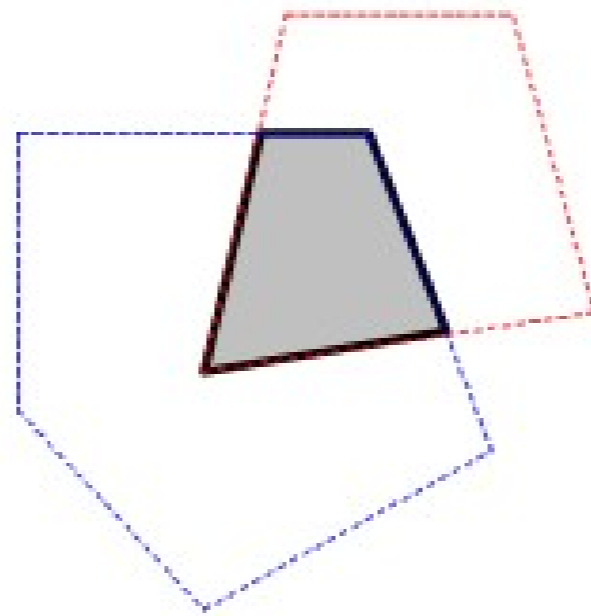
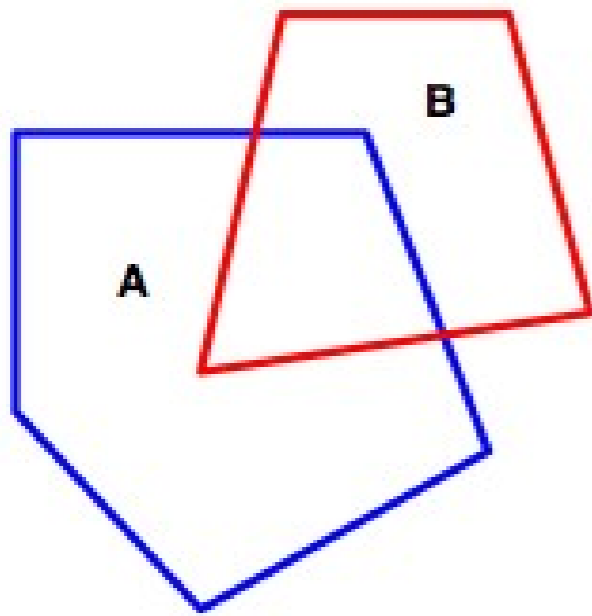
- ▶ **Spatial Functions**

- ▶ ST\_Length(geometry),  
ST\_X(geometry)

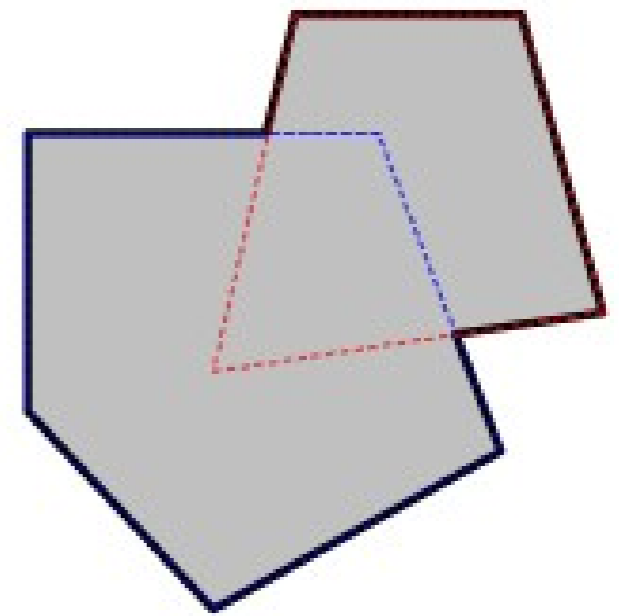
# Open Geospatial Consortium (OGC)



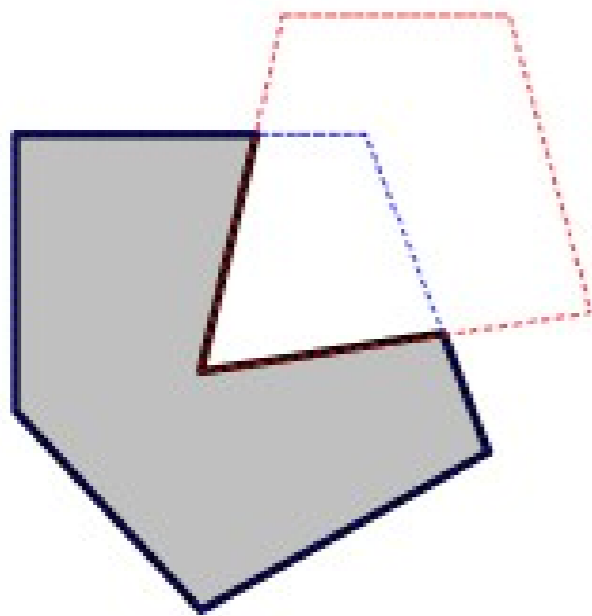
## Simple Features for SQL (SFSQL)



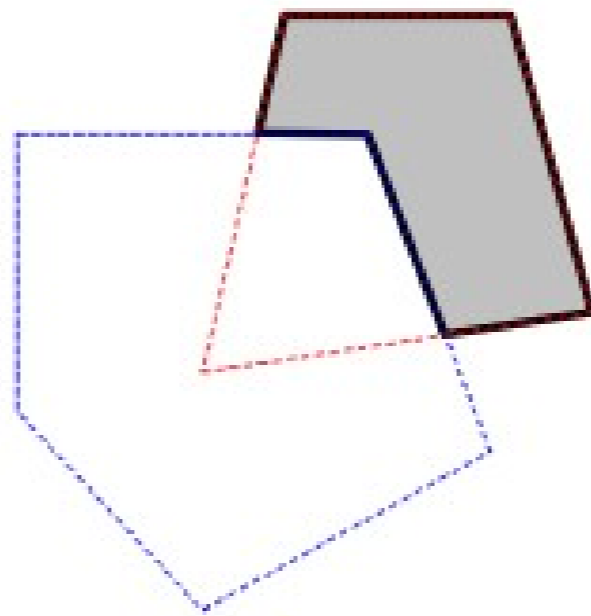
(2)  
A.intersection(B)



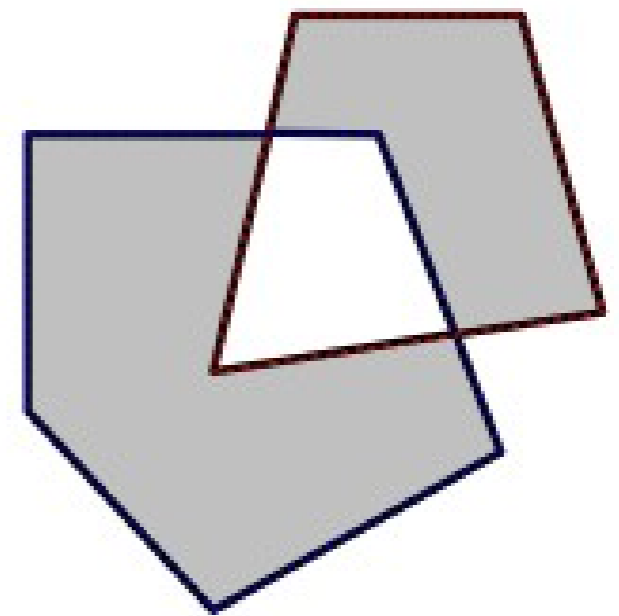
(3)  
A.union(B)



(4)  
A.difference(B)



(5)  
B.difference(A)



(6)  
A.symDifference(B)



*PostGIS*



**ORACLE®**

**S P A T I A L**

Microsoft®  
**SQL Server® 2008**

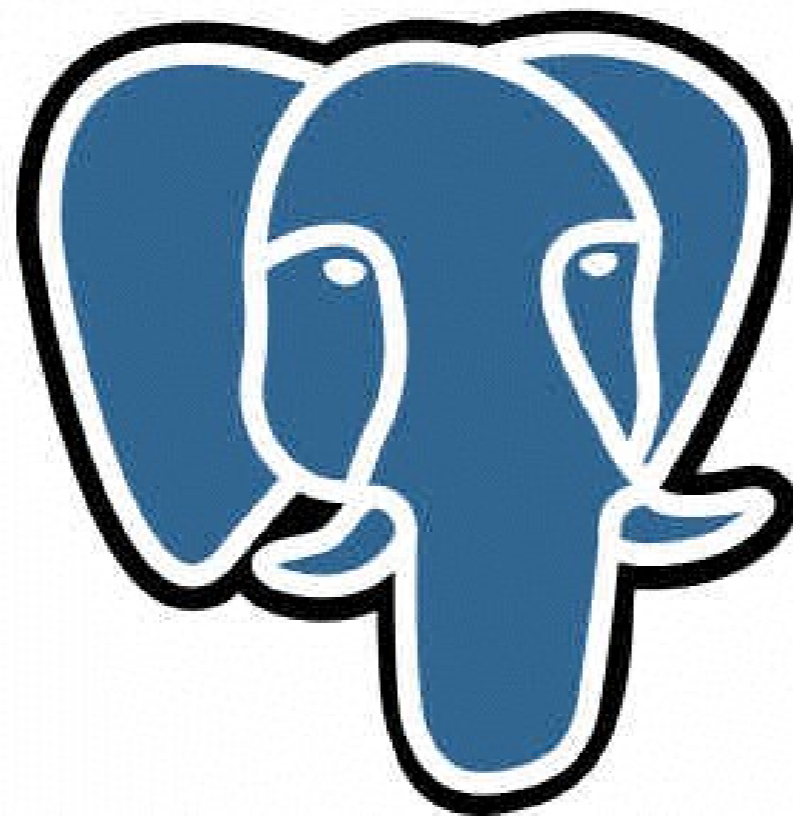


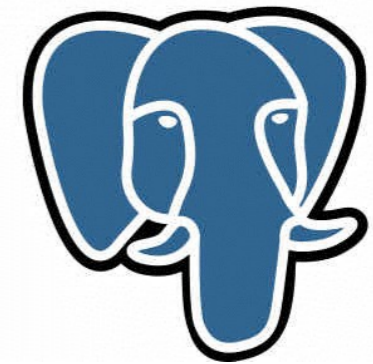




**ArcSDE**

# PostgreSQL





- ▶ **Open Source (BSD)**
- ▶ **“Enterprise” Databases**
  - ▶ 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?  
PostGIS do?

“What parcels are  
within 1km of this  
fire?”

FROM parcels

WHERE

```
ST_DWithin(  
  geom,  
  'POINT()',  
  1000 );
```

```
;  
;  
;
```

“How far did the  
bus travel last  
week?”



FROM

vehicle\_paths

WHERE

(v\_id = 12)

AND

(v\_date > Now() -

'7d');

'7d');

'7d');

'7d');

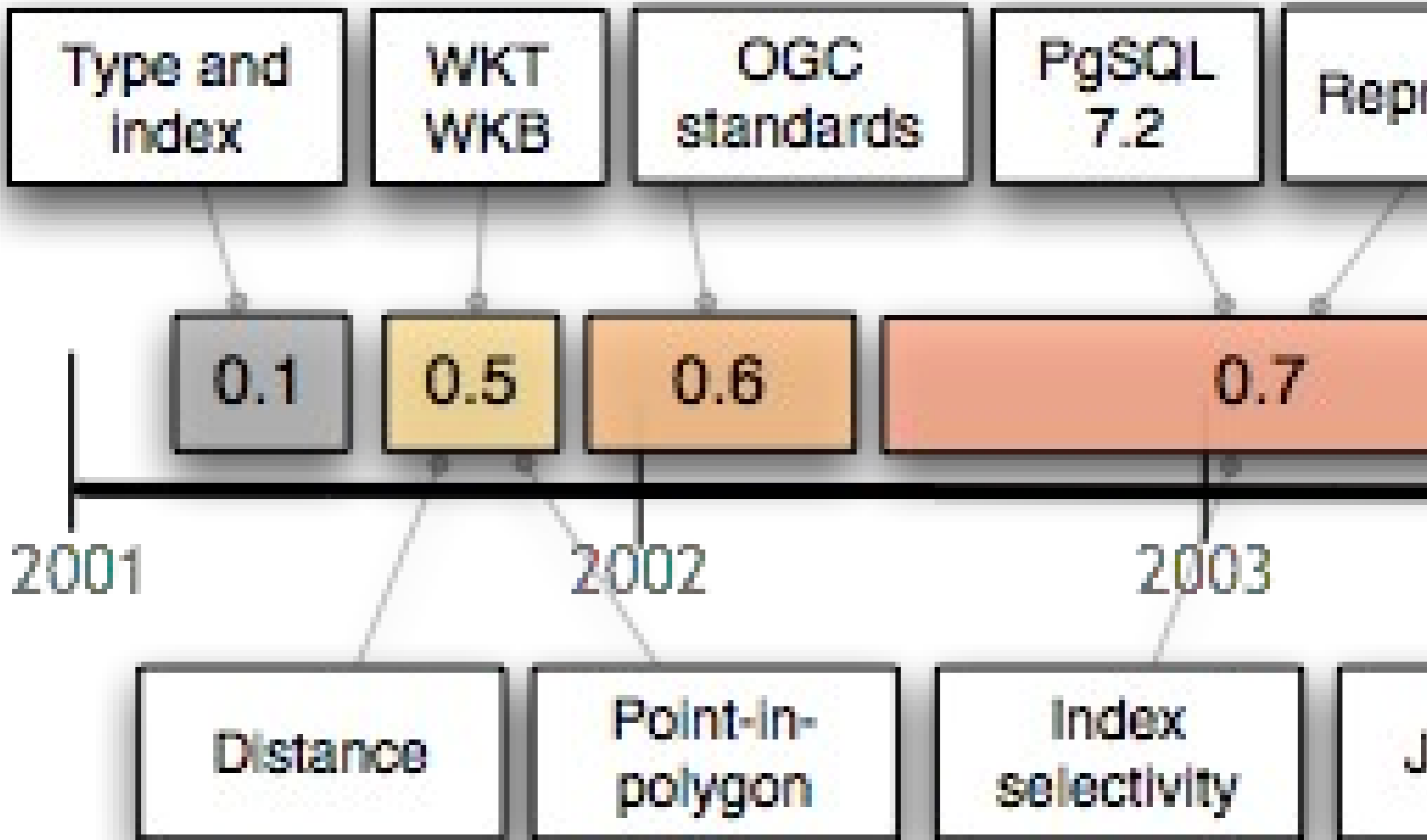
'7d');

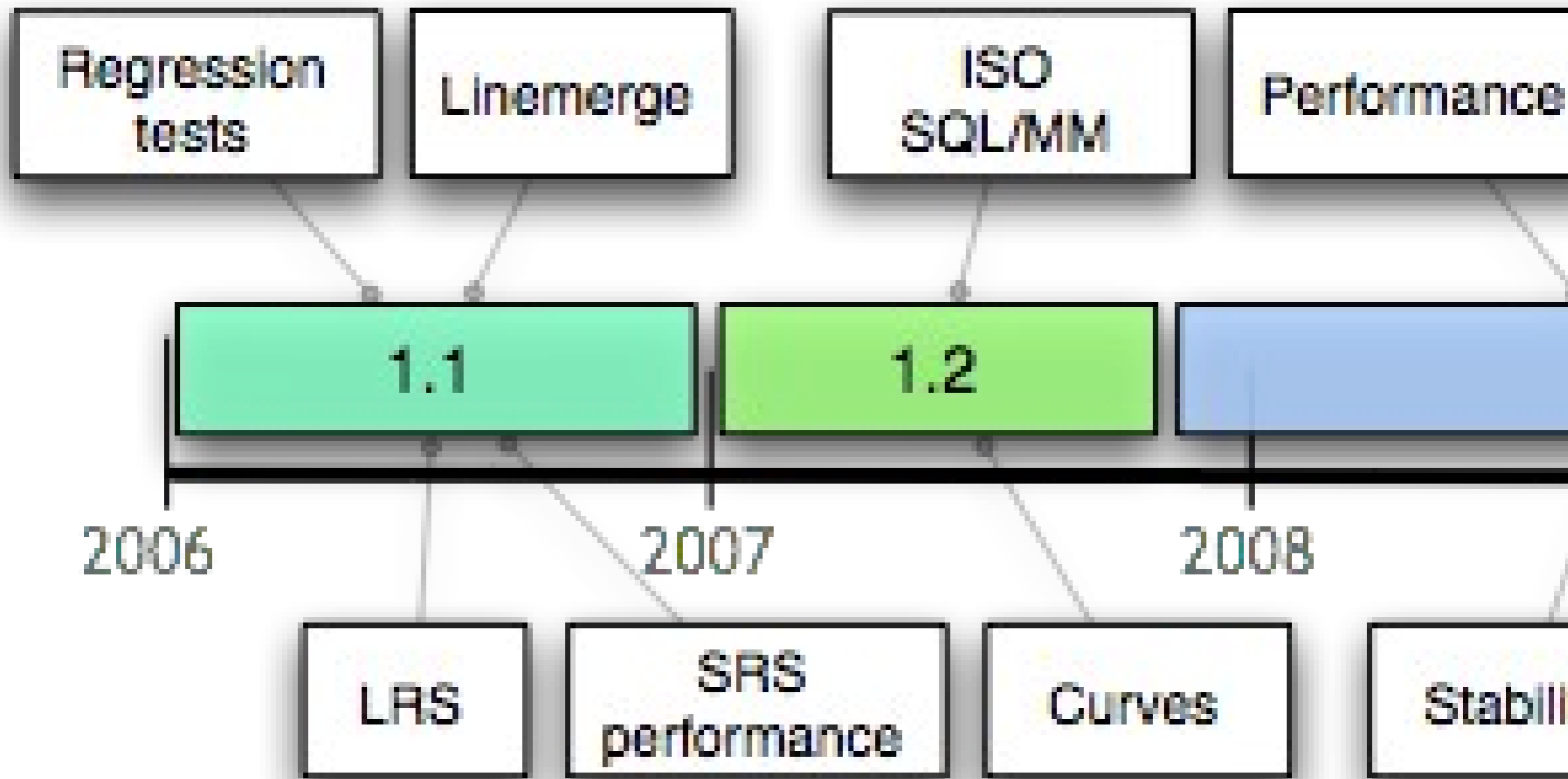
# History!



“Managing  
changing data in  
shape files is a  
pain in the           !”

# History!!!





3D/4D  
Indexing

Typemod for  
GEOMETRY

Raster?

2.0

2011

2012

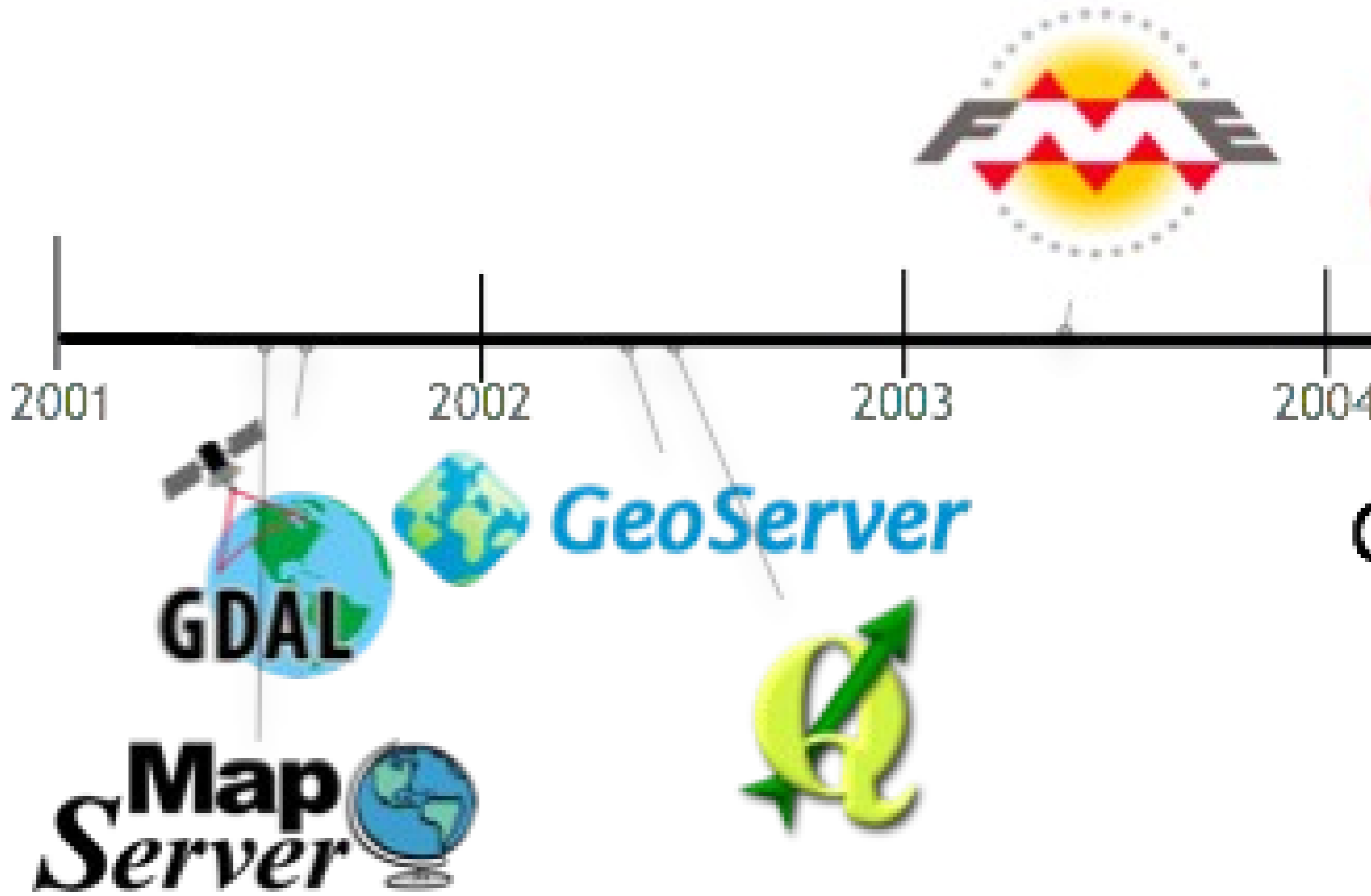
2013

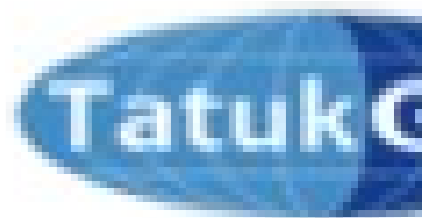
PolyhedralSurface

GUI  
dumper



# More History!!!





ESRI  
ArcGIS  
Server

Autodesk  
MapGuide



AutoCAD  
Map 3D

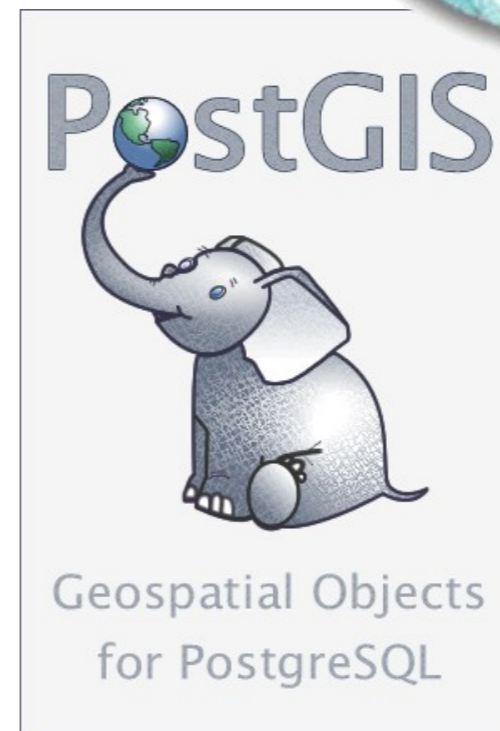


django FDO



“Why are these  
companies  
supporting  
PostGIS?”

# GREEN > ASAP







# DB Evaluation

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

# Transactional Maintenance Maintenance

Check in edits



Check out working  
areas







### Vehicle Path Report

state:

#### Add Assets

Add assets to the report by selecting them below and clicking 'Generate Report.'

**Asset No.:** (select up to 5)

- GSM\_0011
- - select one -
- - select one -
- - select one -
- - select one -

**Date Range:**

from: 2006 Jul 6 00:00

to: 2006 Jul 7 23:59

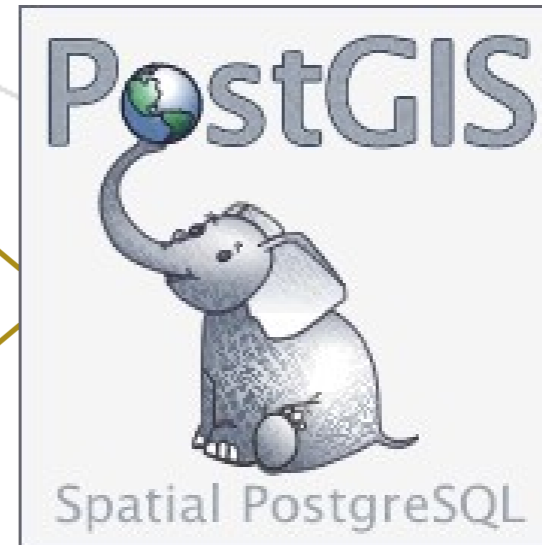
### Vehicle Path Report Data

Row 1 to 1 of 1

Asset No.	Date Range	Distance Traveled	Max Speed	Max Idle Time	KML
▲	from to	▲	▲	▲	▲
<span style="color: red;">■</span> GSM_0011	2006-07-06 16:06 PDT to 2006-07-06 18:49 PDT	23.7 Miles	<span style="color: red;">M</span> 69.9 Mile/Hour	<span style="color: red;">i</span> 00:06:00	



**GSM**



**GROUND TRAFFIC CONTROL™**

Home • Inspections • Drivers • Assets • GPS • Reports • Help

### Vehicle Path Report

Jump to location:  address, city or ZIP:  state:

**Add Assets**  
Add assets to the report by selecting them below and clicking 'Generate Report.'

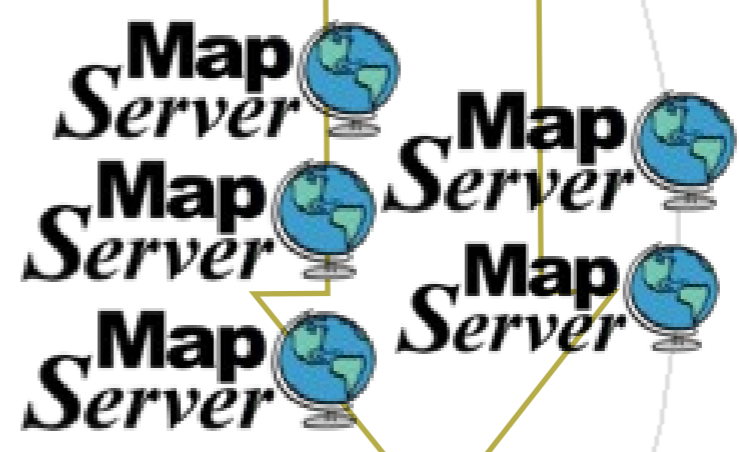
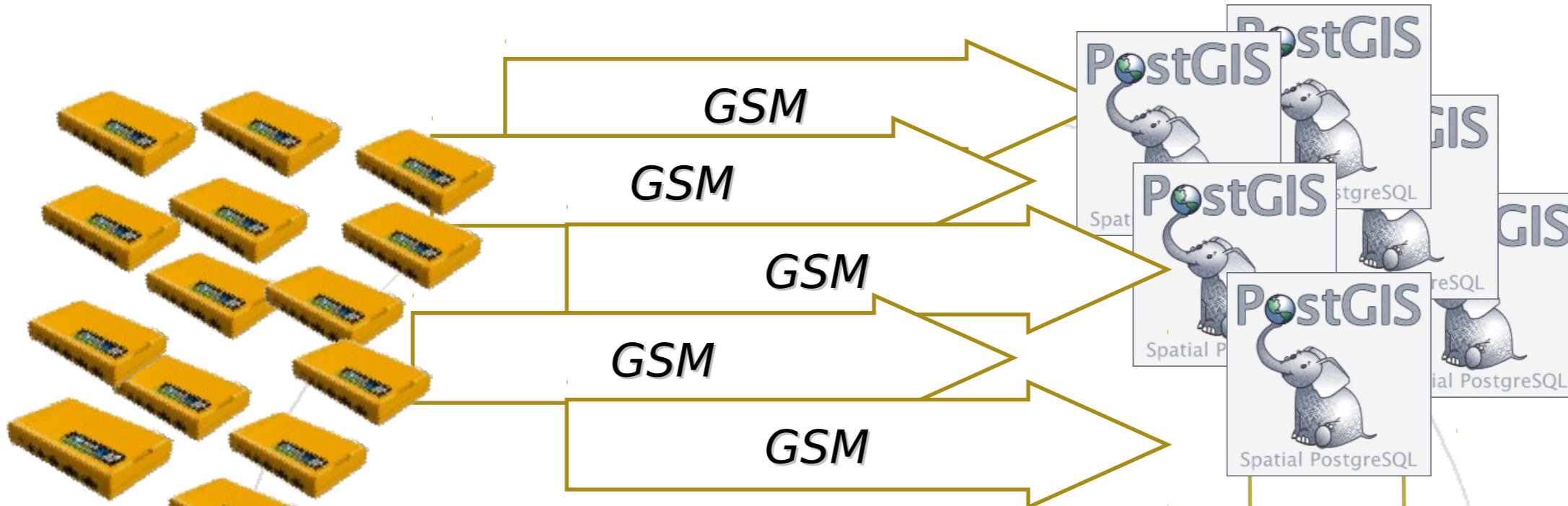
Asset No. (select up to 5)  
- select one -  
- select one -  
- select one -  
- select one -  
- select one -

Date Range:  
from: 2006 Jul 6 00:00  
to: 2006 Jul 7 23:59

#### Vehicle Path Report Data

Row 1 to 1 of 1

Asset No.	Date Range	Distance Traveled	Max Speed	Max Idle Time	KML
	from	to			
GSM_0011	2006-07-06 16:16 PDT	2006-07-06 18:49 PDT	23.7 Miles	66.9 Mile/Hour	00:05:00



**GROUND TRAFFIC CONTROL™**

Home | Inspections | Drivers | Accidents | GPS | Reports | Help

### Vehicle Path Report

Jump to location:  address, city or ZIP:  state:

Add assets to the report by selecting them below and clicking 'Generate Report.'

Asset No. (select up to 5)  
 GSM\_0011  
 - select one -  
 - select one -  
 - select one -  
 - select one -

Date Range:  
 from: 2006 Jul 6 00:00  
 to: 2006 Jul 7 23:59

Vehicle Path Report Data						
Row 1 to 1 of 1						
Asset No.	Date Range		Distance Traveled	Max Speed	Max Idle Time	KML
	from	to				
GSM_0011	2006-07-06 16:16 PDT	2006-07-06 18:49 PDT	23.7 Miles	66.9 Mile/Hour	00:05:00	



EarthWhere

Search Criteria

Reset Apply

Filters

Sources

Select Data Source(s)

- CADRQ-1.10K (C0)
- CADRQ-1.12.50K (C0)
- CADRQ-1.15K (C0)
- CADRQ-1.20K (C0)
- CADRQ-1.25K (C0)
- IGR2M1000
- ETM\_PAN
- ETM\_THM
- ETM\_VIR
- IONOS

Note: Hold Ctrl + [Left] Click to select multiple.

Clear Select All Select My Data Sources

Limit to Best Coverage

Dates

Attributes

Center (Lon,Lat): 46.20000000, 32.50000000 | Scale: 1 : 8340965 | Map Details

Search Results

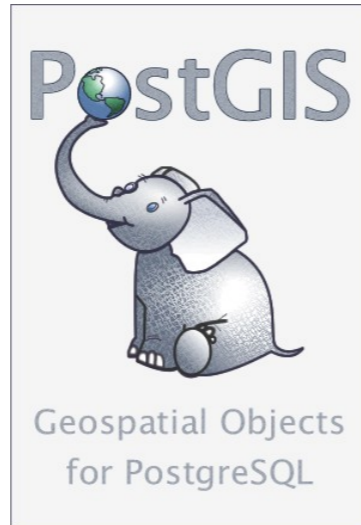
23 of 23 Elements Selected

Zoom	Select	Action	ID	Data Source	Description	Acquired Date	CSD	Bands	Priv
	<input checked="" type="checkbox"/>	P,C	23	IONOS	pa_77735_rgb_0010000	Aug 20, 2001	1.000316505	3	F
	<input checked="" type="checkbox"/>	P,C	22	IONOS	pa_77735_rgb_0000000	Aug 20, 2001	1.000340059	3	F
	<input checked="" type="checkbox"/>	P,C	25	CADRQ-1.10K (C0)	CADRQ 1:10K (C0)	Mar 29, 2003	1.407889311	3	F
	<input checked="" type="checkbox"/>	P,C	13	CADRQ-1.15K (C0)	CADRQ 1:15K (C0)	Mar 29, 2003	2.071386882	3	F
	<input checked="" type="checkbox"/>	P,C	14	CADRQ-1.15K (C0)	CADRQ 1:15K (C0)	Mar 29, 2003	2.085899306	3	F
	<input checked="" type="checkbox"/>	P,C	15	CADRQ-1.15K (C0)	CADRQ 1:15K (C0)	Mar 29, 2003	2.091696523	3	F
	<input checked="" type="checkbox"/>	P,C	16	CADRQ-1.15K (C0)	CADRQ 1:15K (C0)	Mar 29, 2003	2.095085886	3	F
	<input checked="" type="checkbox"/>	P,C	17	CADRQ-1.15K (C0)	CADRQ 1:15K (C0)	Mar 29, 2003	2.104160120	3	F

Select All Deselect All

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-No Actions Available-

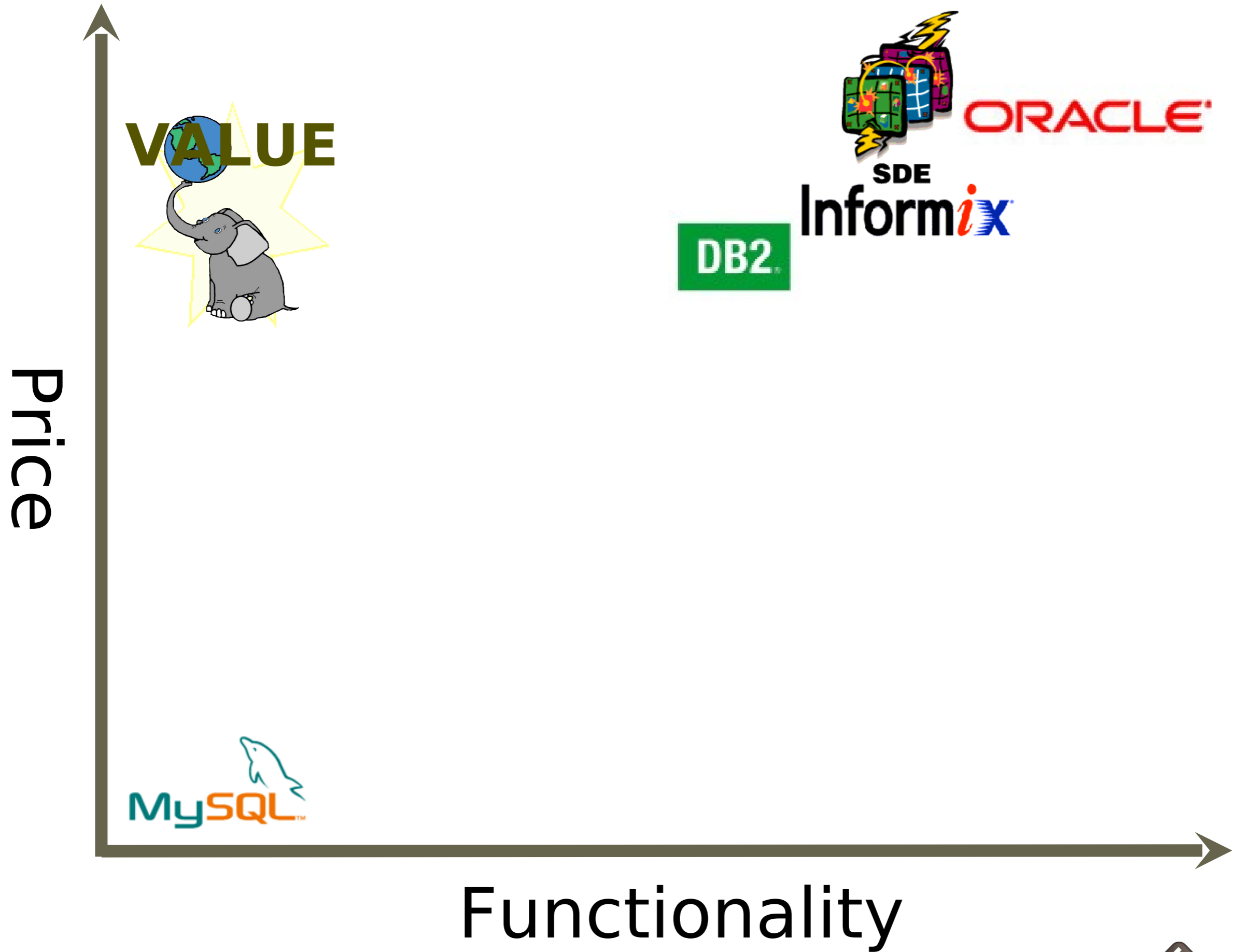


Contraloría General de la República de Panamá



# Scalability

<b>“Enterprise”</b>	<b>1 Dual-Core</b>	<b>2 Quad-Core</b>
Oracle	\$40,000	\$160,000
IBM DB2	\$36,400	\$145,600
MS SQL Server	\$25,000	\$50,000
IBM Informix	\$50,000	\$200,000
PostGIS	\$0	\$0



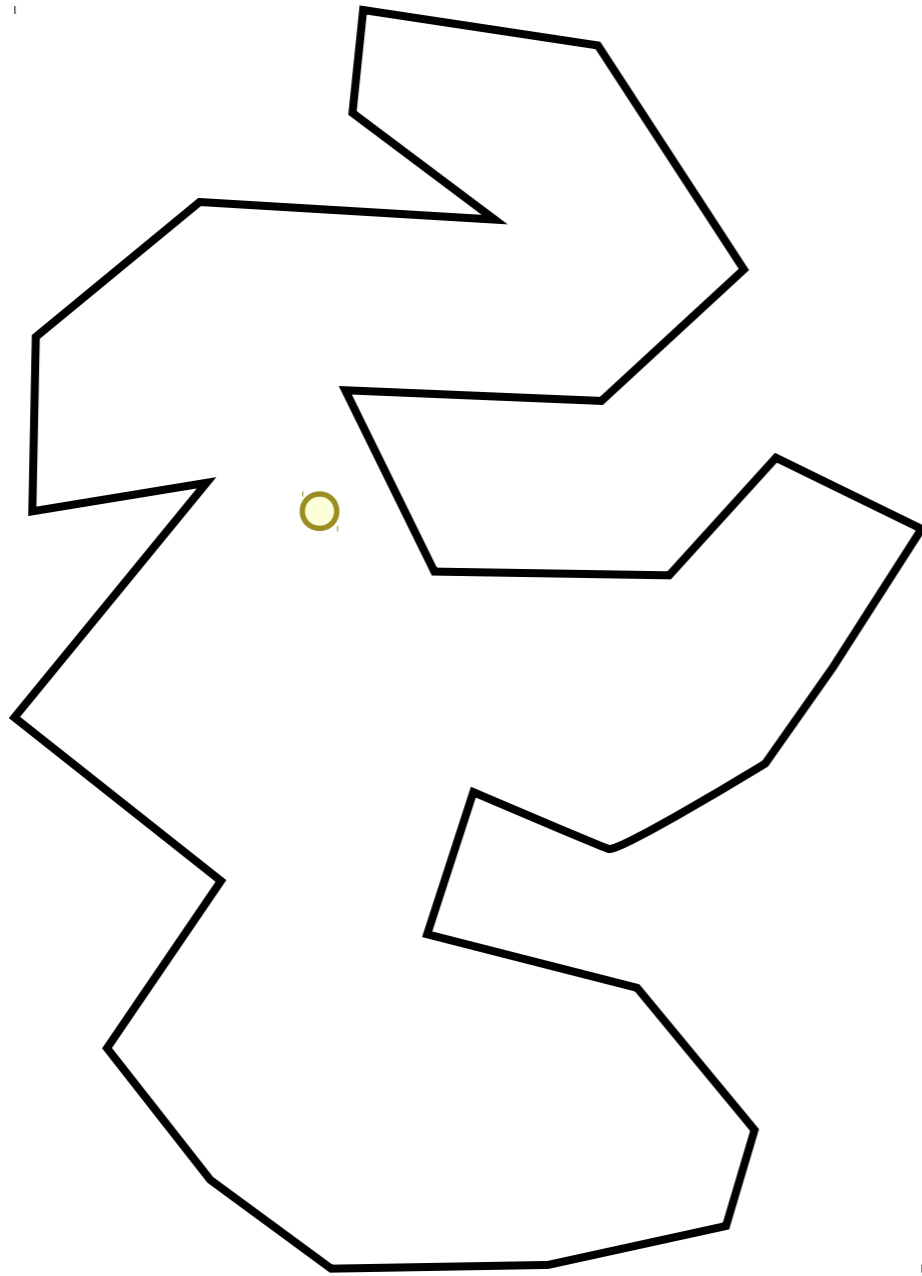
# What's New?



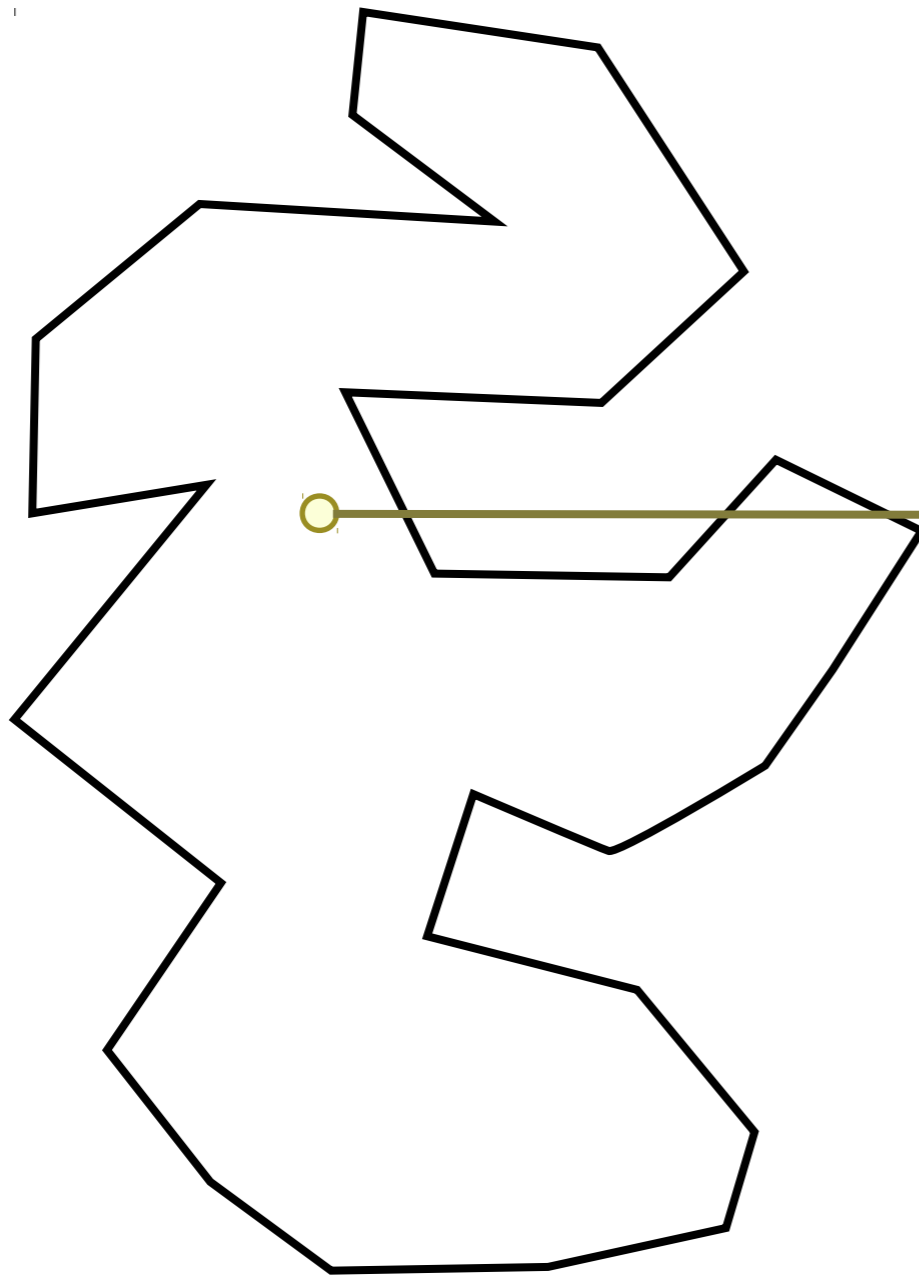
# PostGIS 1.4

- **January 2009**
- Prepared geometry
- Cascaded union
- Curves
- GeoJSON

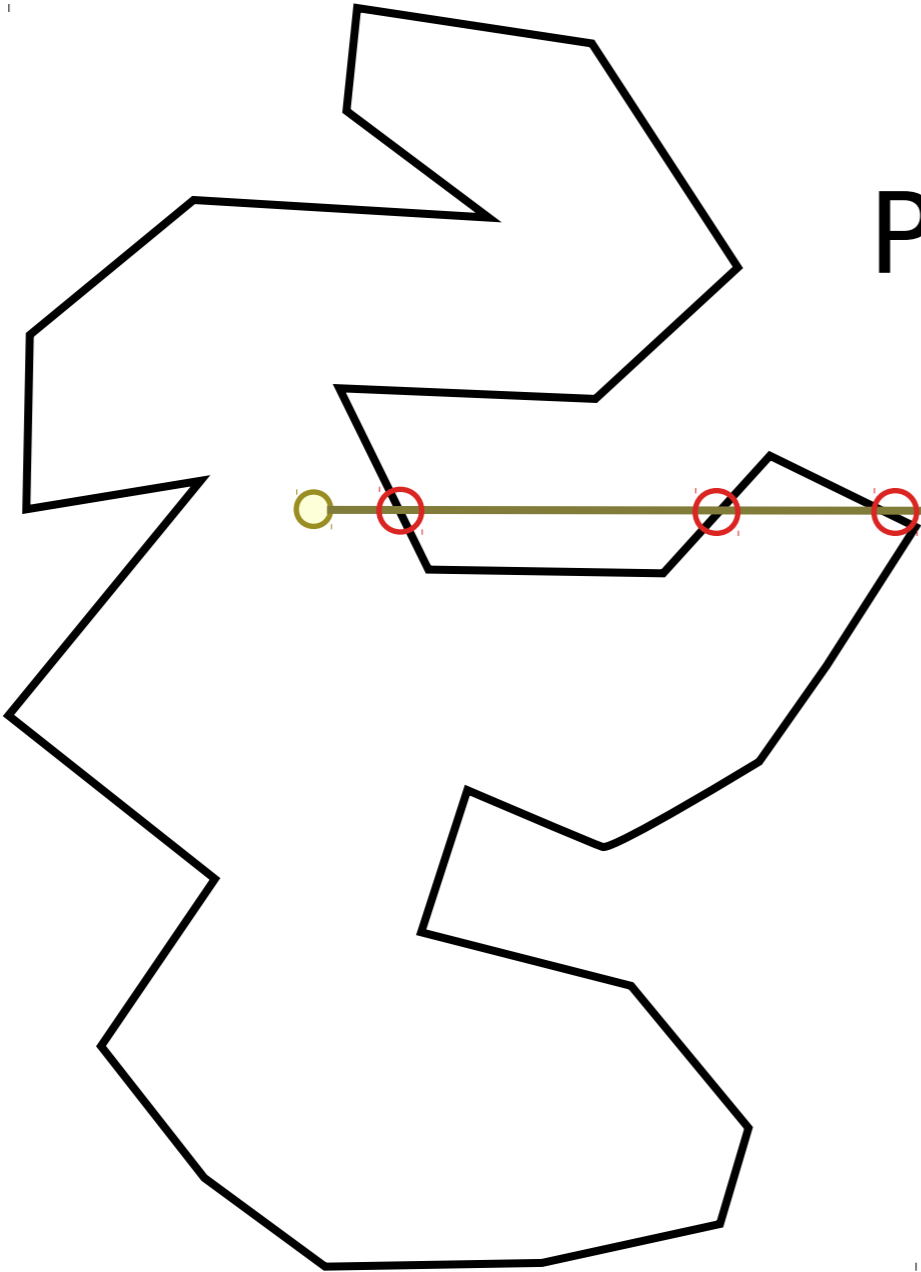
# Prepared geometry geometry

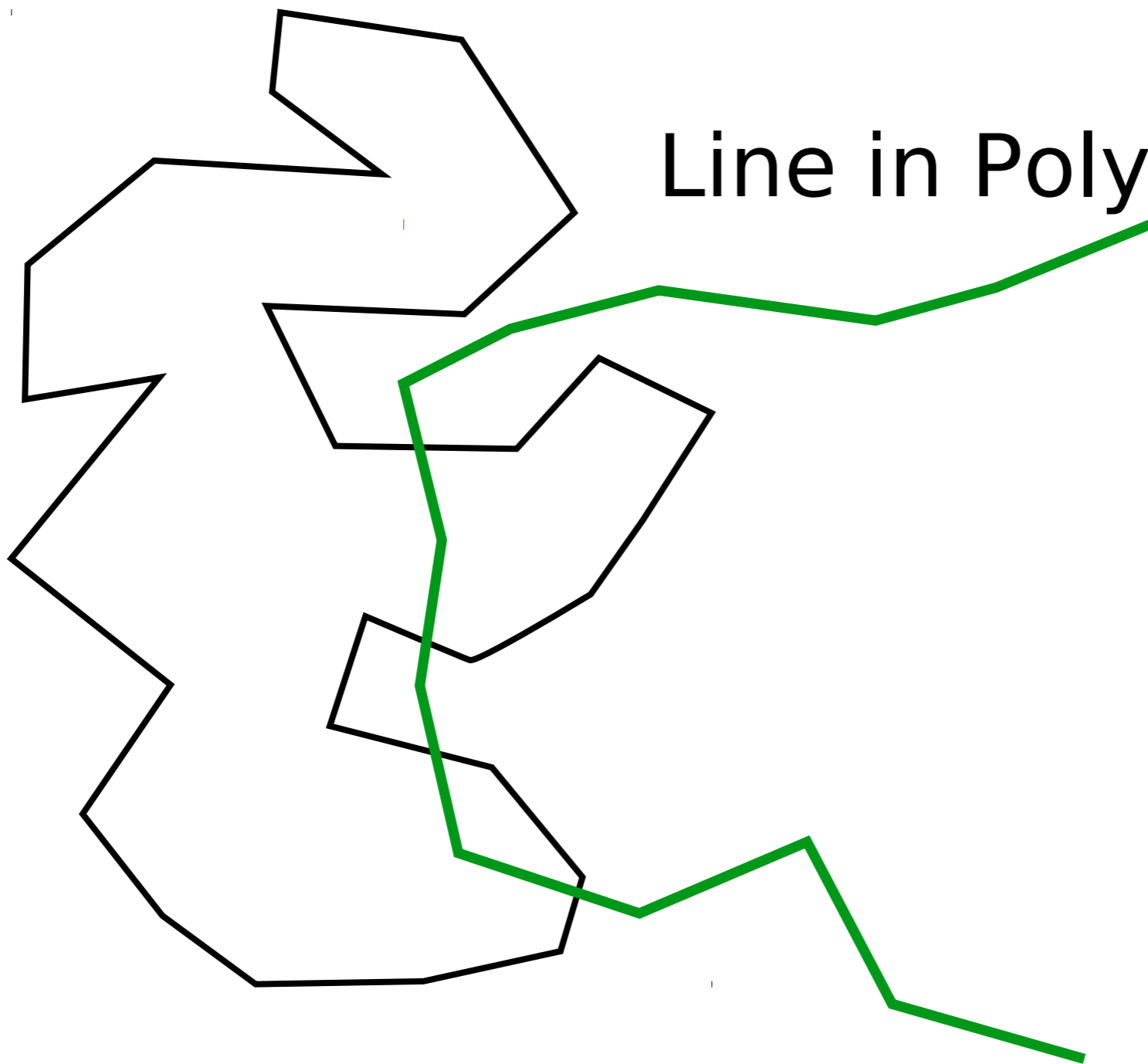


# Point in Polygon



Point in Polygon =  $O(n)$



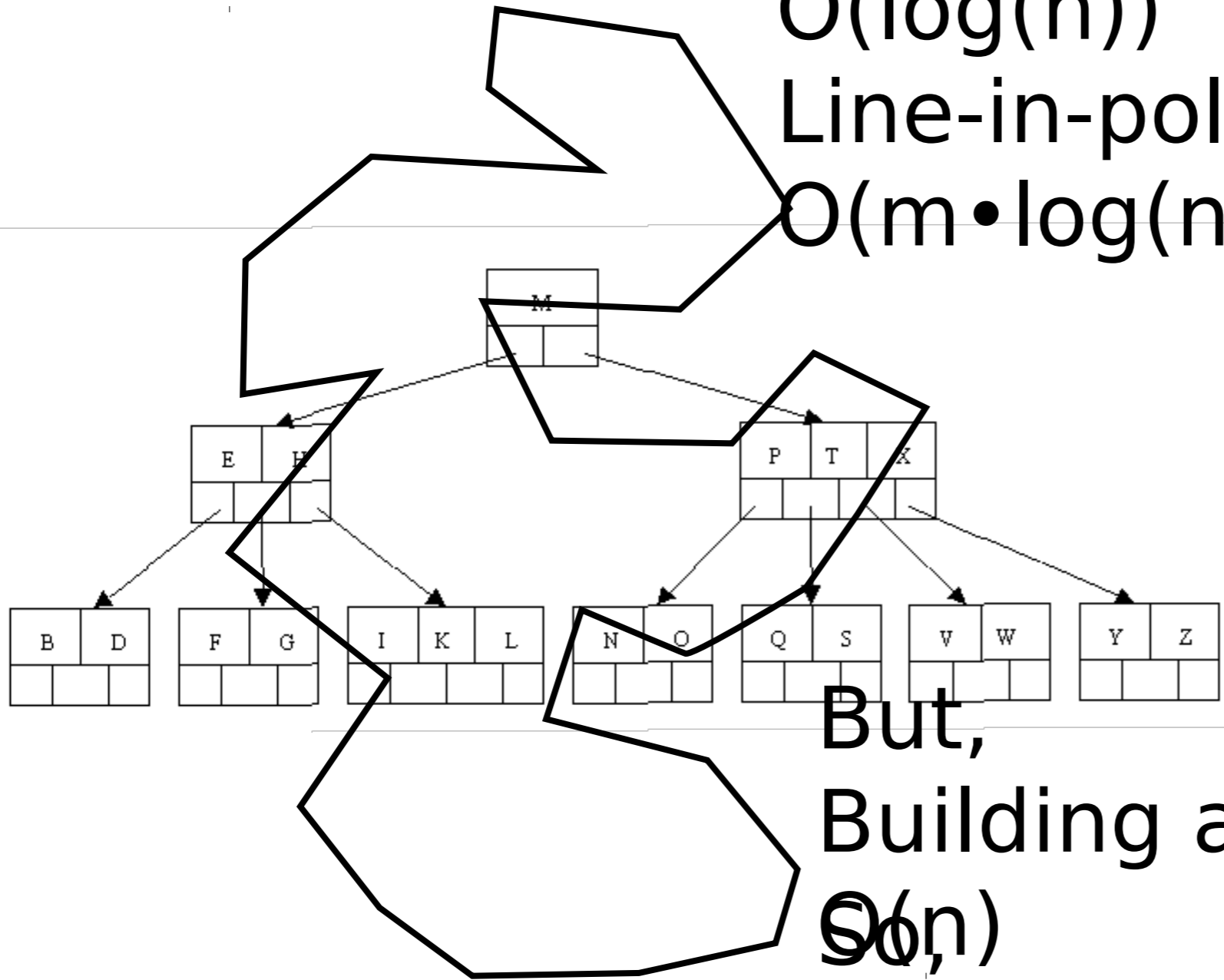


Line in Polygon =  $O(n \cdot m)$

Build spatial index on edges!

Point-in-polygon ==  
 $O(\log(n))$

Line-in-polygon ==  
 $O(m \cdot \log(n))$



But,

Building an index takes  
 $O(n)$

Cache index and re-use  
it!

Prepared geometry  
makes repeated tests  
on large geometries  
very fast.

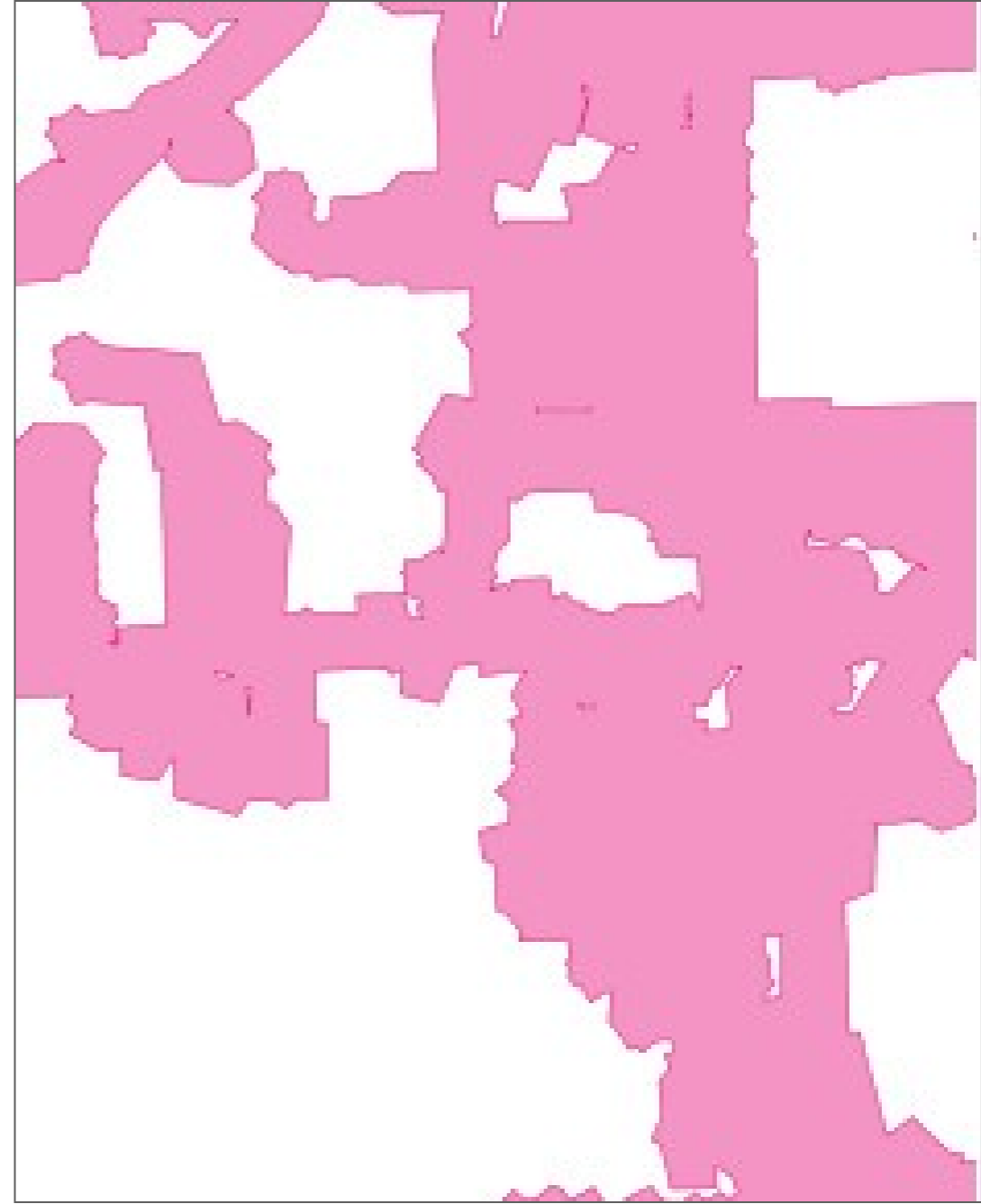
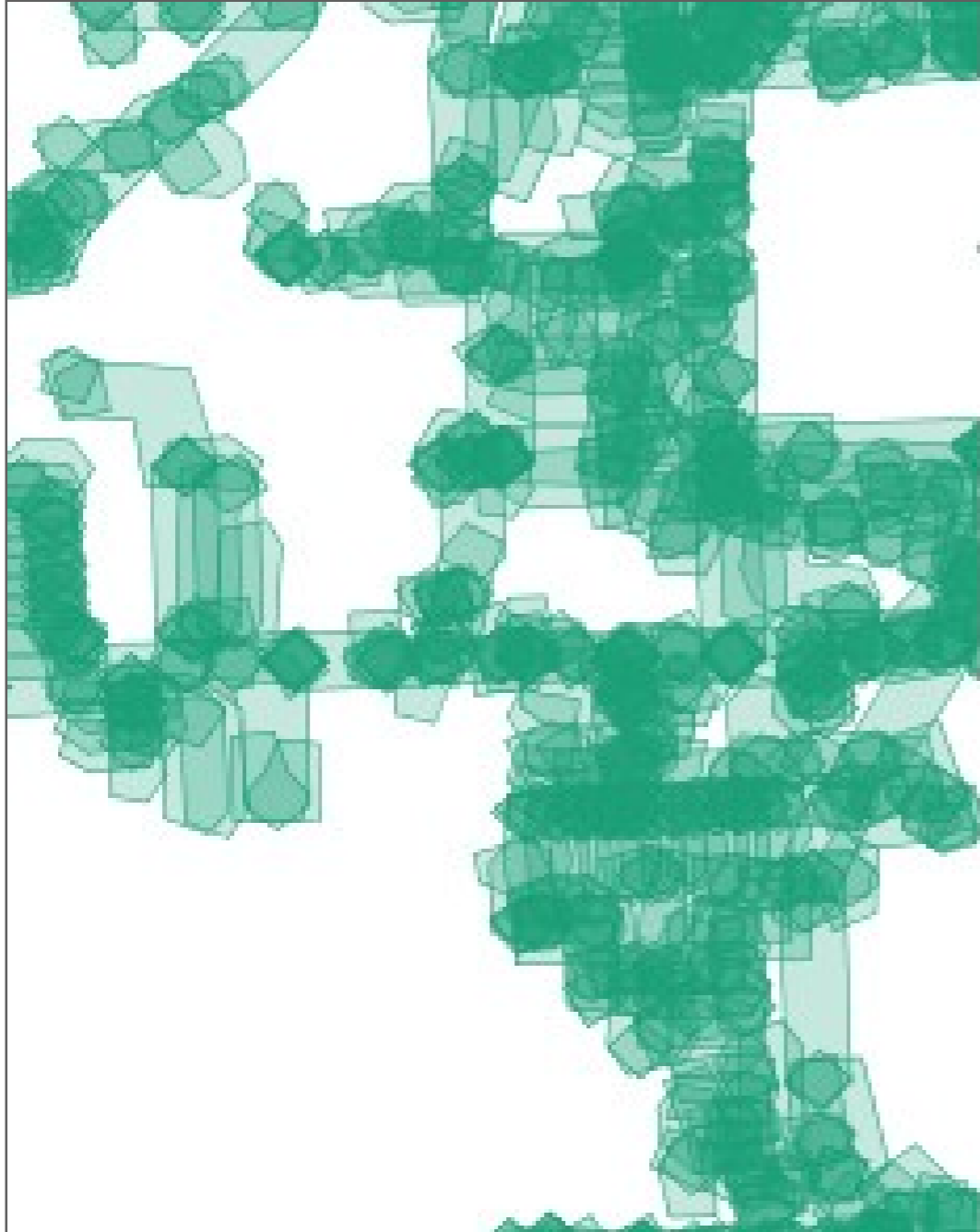
polygons

WHERE

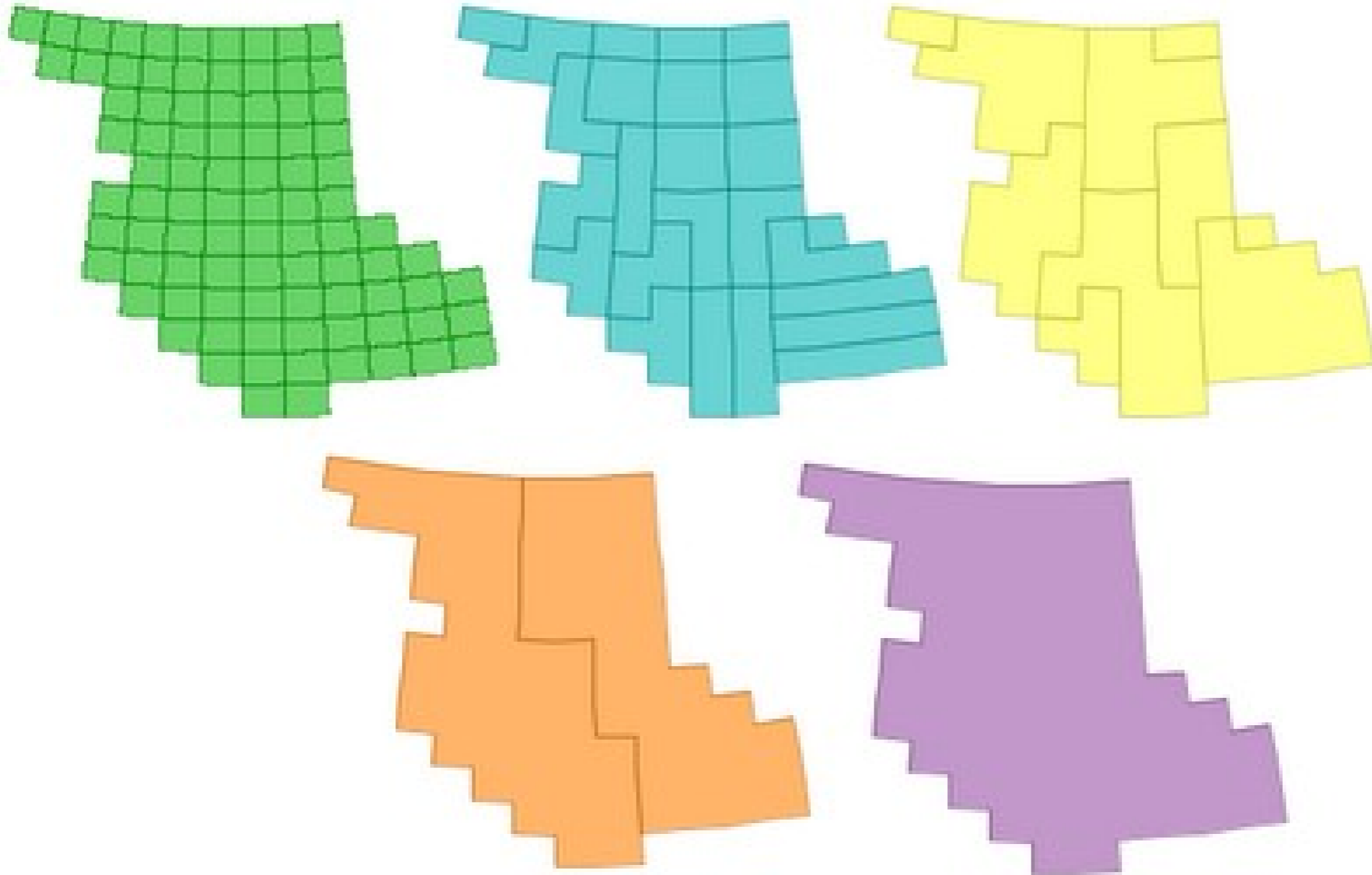
ST\_Contains(  
polygons.geom,  
points.geom  
)  
)  
)  
)  
)



# Cascaded union



# Cascaded union

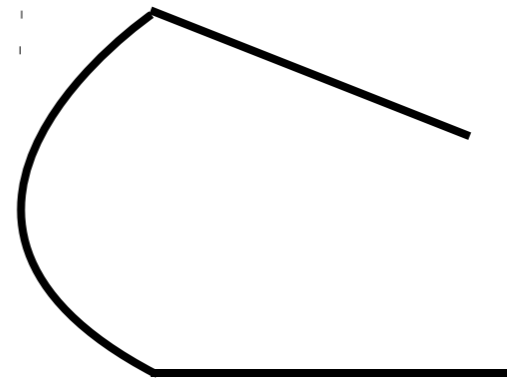


# Curves

- 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**

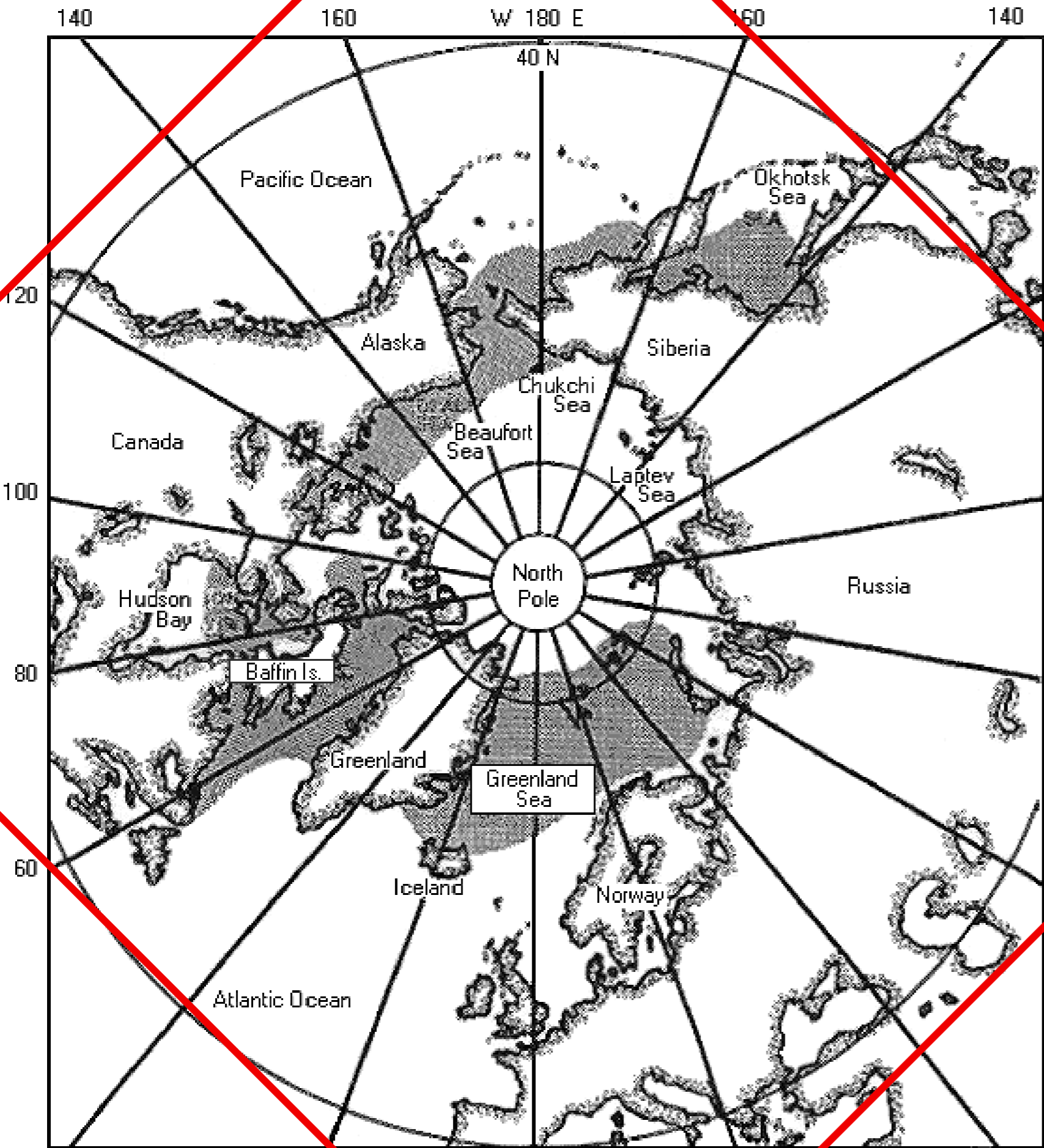
**ST\_GeomFromKML**

**()**

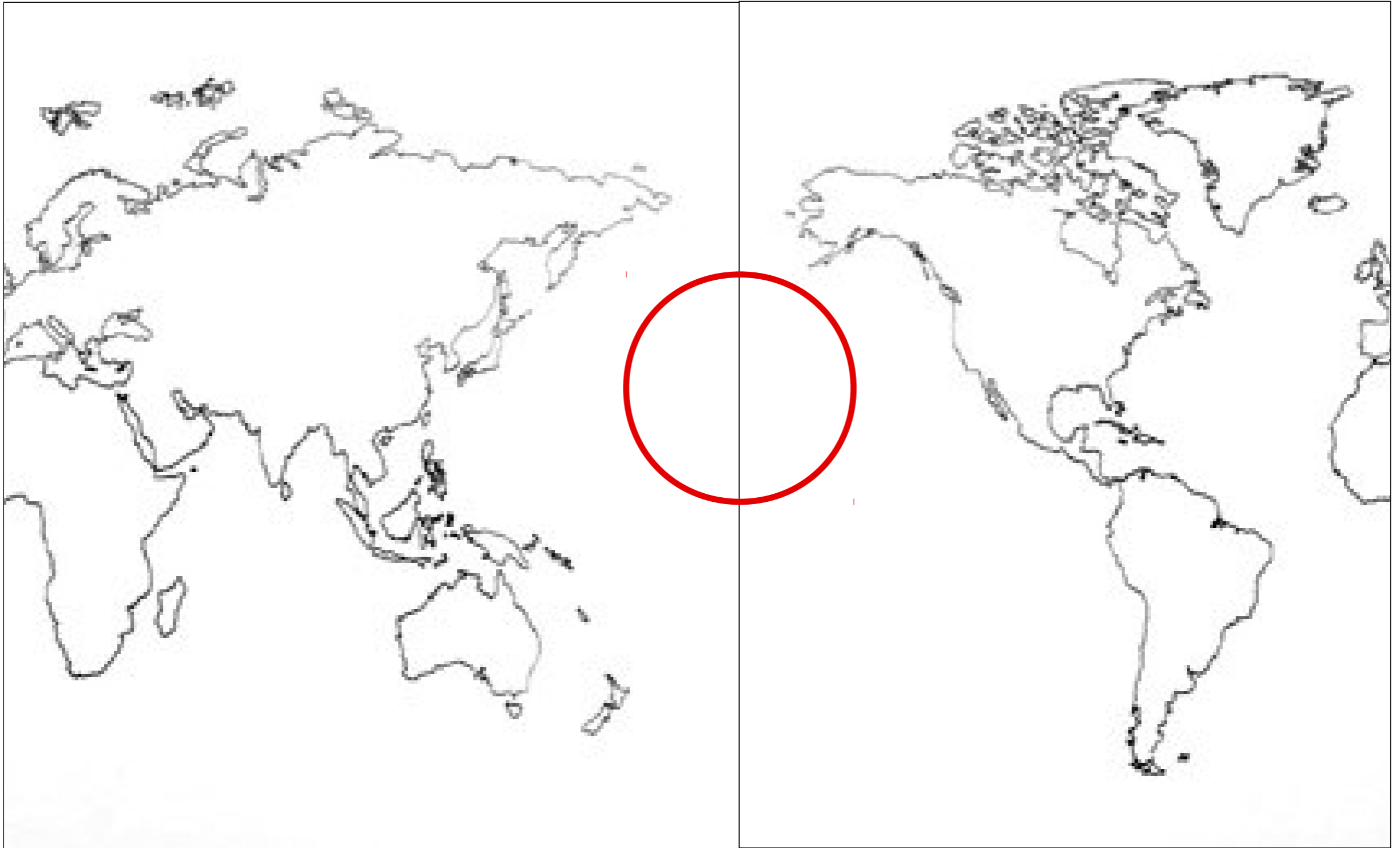




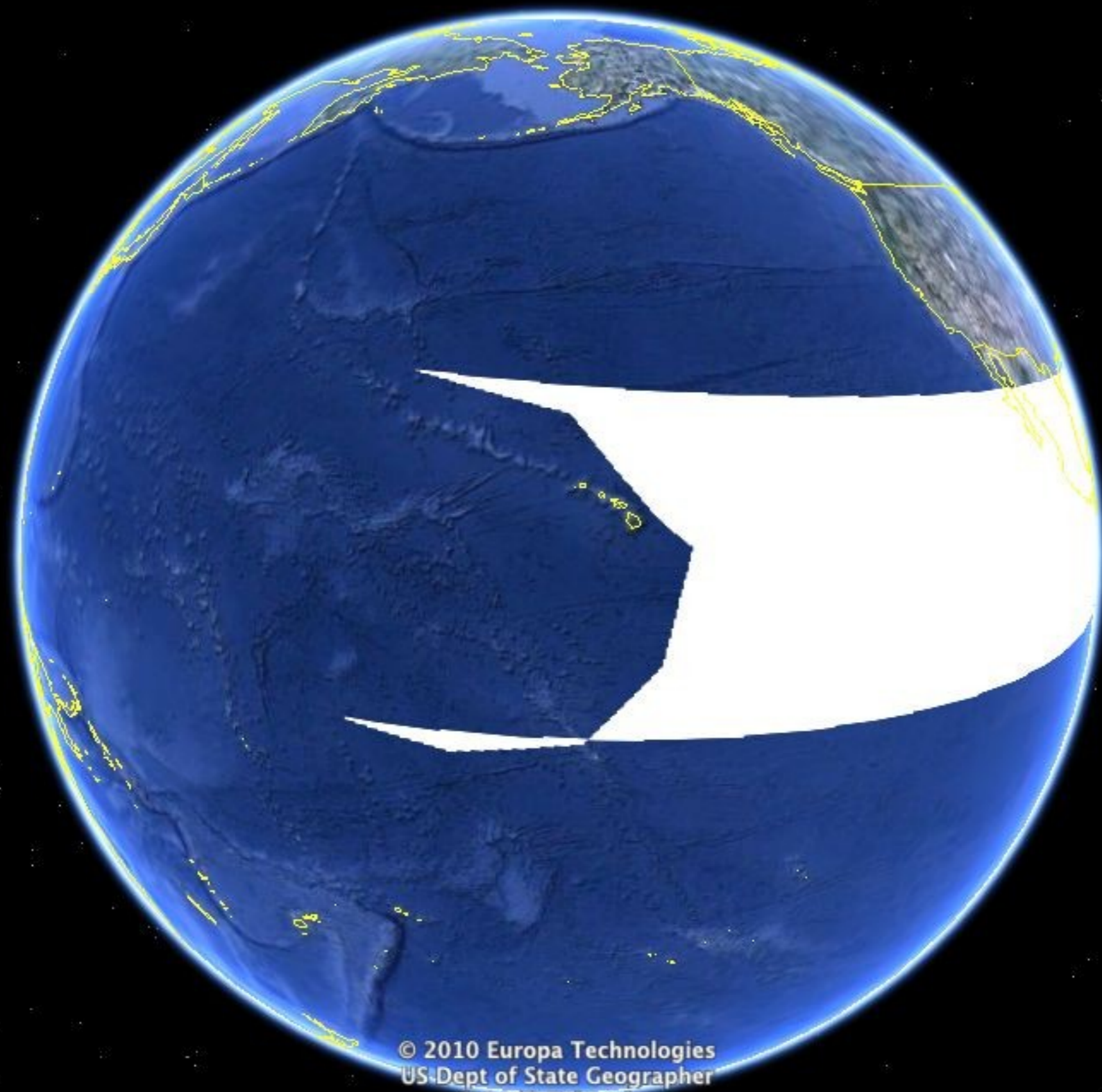












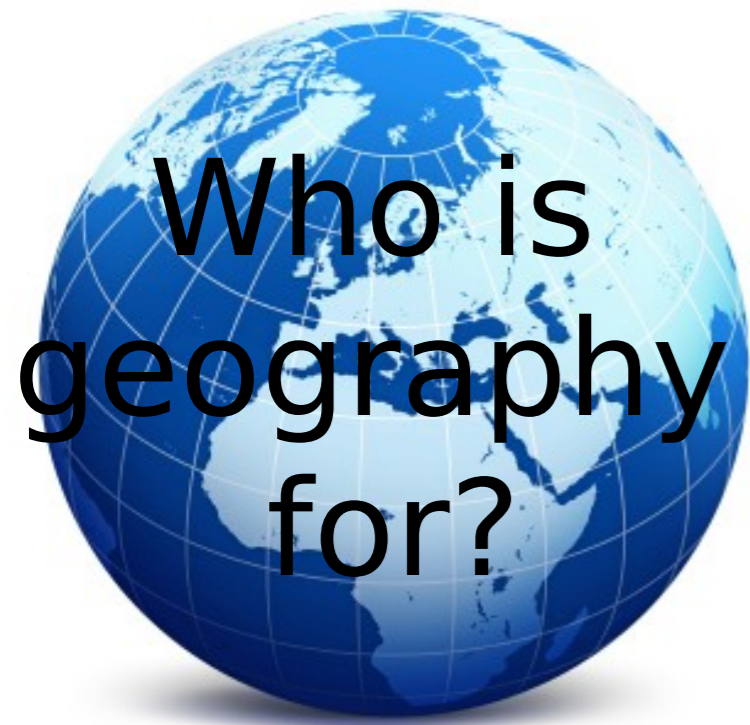
© 2010 Europa Technologies  
US Dept of State Geographer  
© 2010 Tele Atlas  
© 2010 Google

16°57'05.47" N 161°04'01.25" W elev -18347 ft

©2009 Goo

Eve alt 6825.77 mi

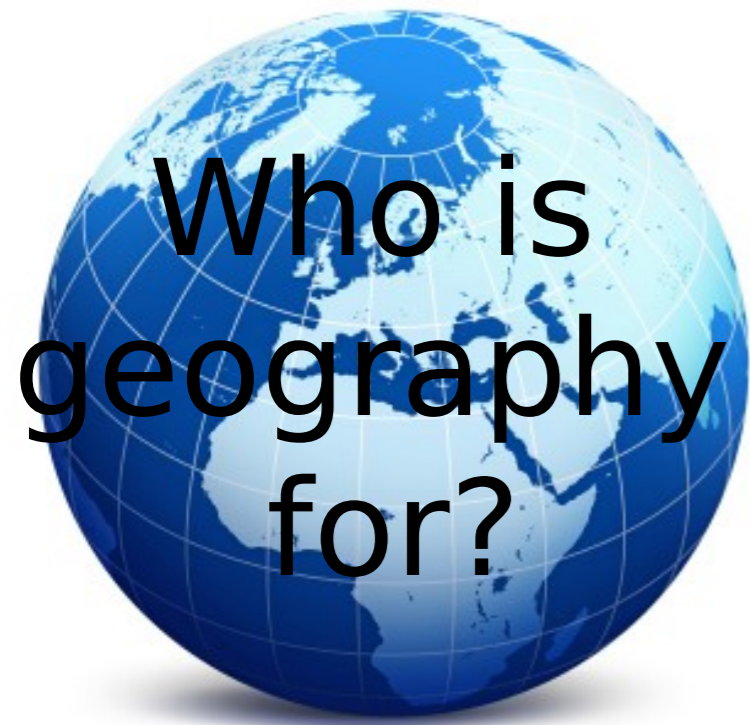
 OPENGEO



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.”



# GeoHugies

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





# Geography functions?

- Indexes spherical data
- `ST_Intersects()`
- `ST_Distance()`
- `ST_DWithin()`
- `ST_Area()`
- **Casts to/from  
GEOMETRY**



shp2pgsql

```
shp2pgsql -D -s 4326 \  
-i \  
countries.shp \  
countries \  
| psql -U pramsey \  
-d geodatabase
```

shp2pgsql

### Shape File to PostGIS Importer

Shape File:

PostGIS Connection:

Username:

Password:

Server Host:

Database:

Connection succeeded.

Configuration:

Destination Schema:  SRID:

Destination Table:  Geometry Column:

Import Log:

```
Connecting: host=localhost port=54321 user=postgres dbname=nyc
password=*****
Connection succeeded.
```

# 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!)**

typmod?

geometry\_columns

тип мод?

```
CREATE TABLE table  
(my_spatial  
id INT, name VARCHAR);
```

типмод?

```
SELECT AddGeometryColumn(
  'my_schema',
  'my_table',
  'geom',
  2,
  'POINT',
  1);
```

тип mod?

```
CREATE TABLE table  
(  
  id INT NOT NULL,  
  geom GEOMETRY(Point, 26910)  
)
```



# Thanks!

Paul Ramsey  
pramsey@opengeo.org