

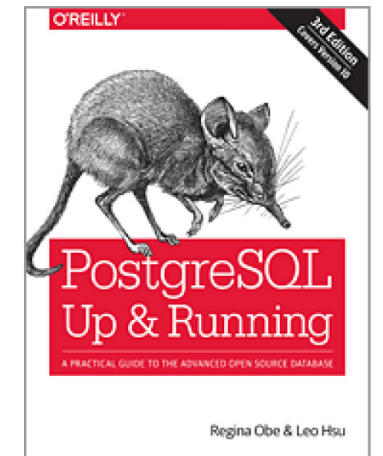
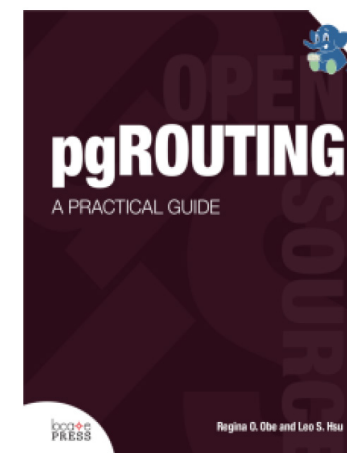
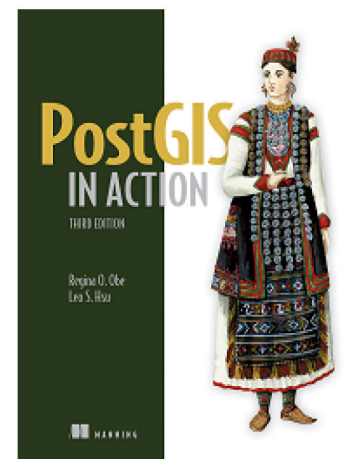
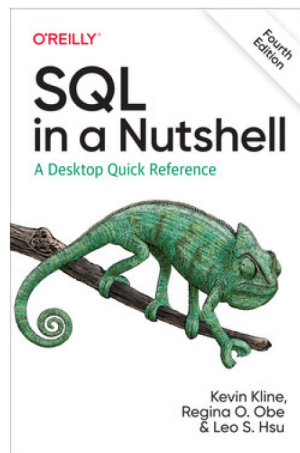


# The Open Source Geospatial community, Postgis, & Postgres community, Postgres



**Regina Obe**

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# Books Coming

- **pgRouting (a practical guide) 2nd Ed** ([Locate Press](#)) in Progress.
- **The Book of PostgreSQL** ([No Starch Press](#)) in Progress

# WHAT IS POSTGIS?

PostGIS is a set of PostgreSQL extensions to manage and query spatial data in a PostgreSQL database. Spatial data is any data involving space and what inhabits space.



# WHAT'S IN A NAME?

Post-Jis

Post G I S

Post Gees

# WHY POSTGIS?

To make spatial data *not* special

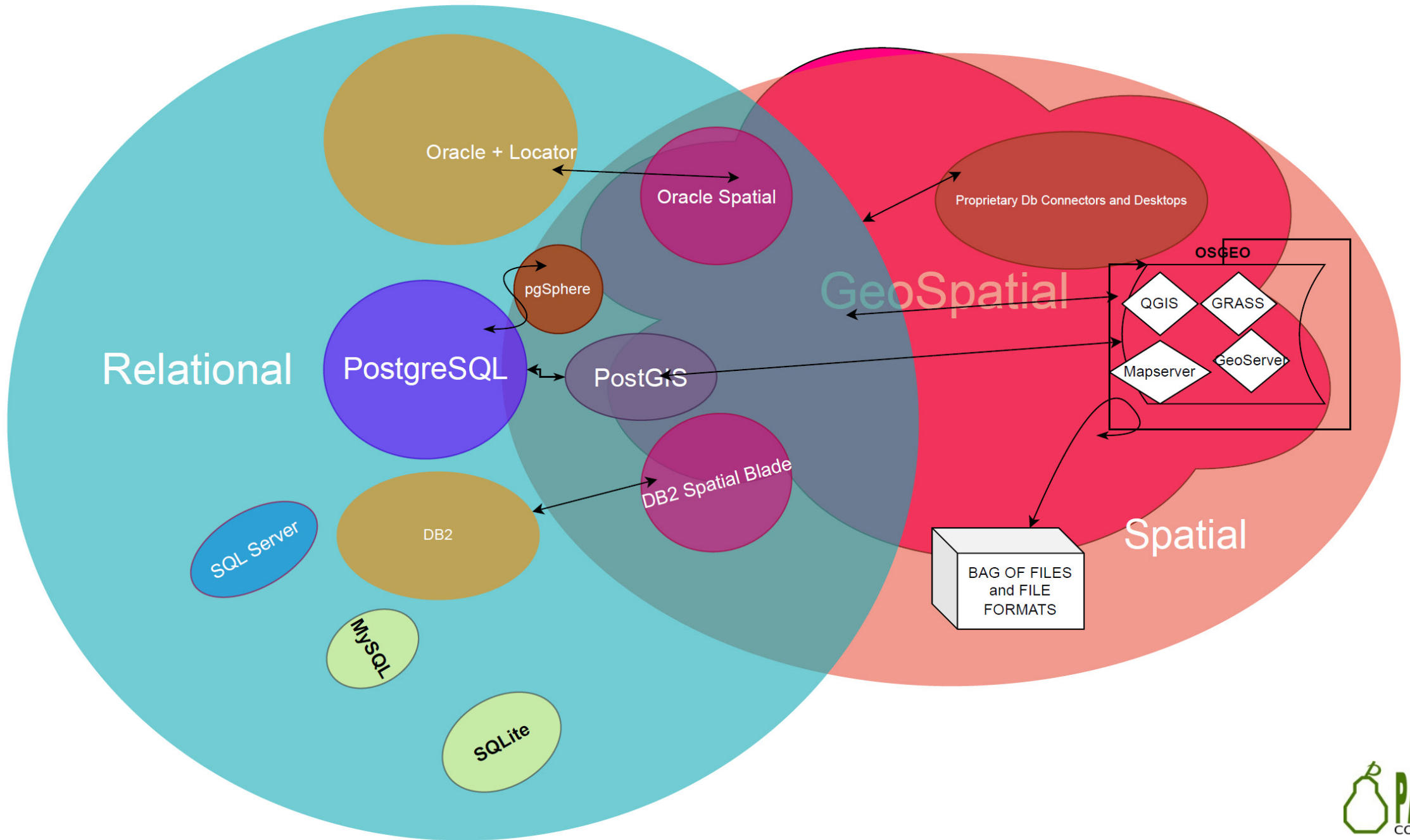
# SPATIAL STANDARDS & SQL

- OpenGeospatial Consortium Simple Features for SQL (OGC SFSQL)
- SQL/MM - Part of ISO SQL Standard
- Standard output formats - Well-Known Text (WKT), Well-Known Binary (WKB), GML, KML, SVG, GeoJSON, MVT, X3D (W3C standard based on VRML)

2001 POSTGIS IS BORN

**To make spatial data not special**







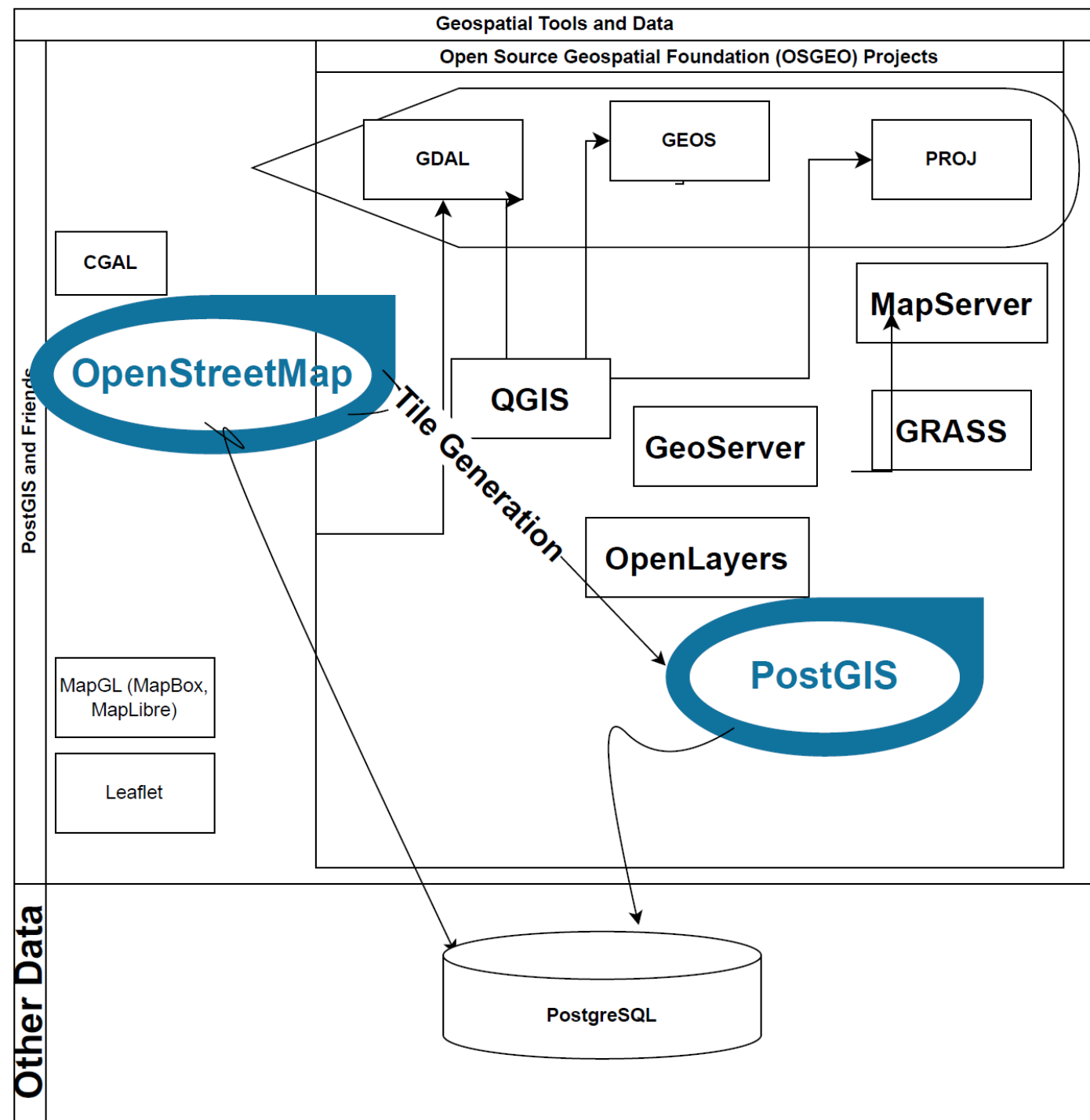
# THE INTERSECTION OF TWO WORLDS

- Relational
- Spatial (Geo)

# PostGIS



# OPEN SOURCE GEOSPATIAL, POSTGIS, & POSTGRES



# SPATIAL DATA IS NOT SPECIAL?

## What? **Not** Only **Special**

You can use PostGIS anywhere you can use SQL and Postgres. If you know SQL, you know 90% of what you need to know about PostGIS

.NET, C, Go, Java, NodeJS, PHP, Python, R, Rust, **SQL**, and more

But you can also use fancy tools to look at it in its full glory

# EXAMPLE POSTGIS QUERY 1:

What are the 3 closest roads to me?

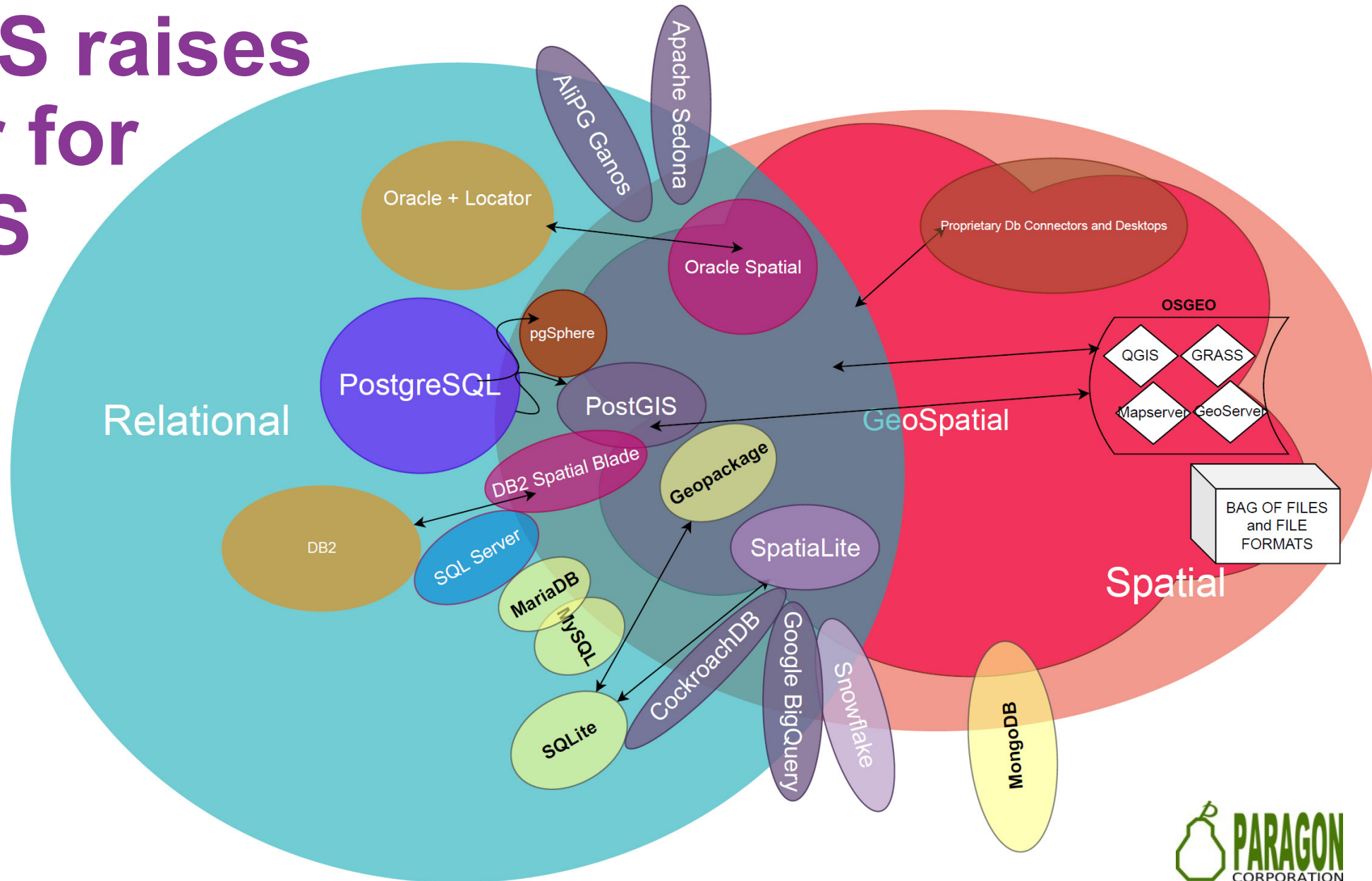
```
SELECT road_name, s.geog <-> ST_Point(:param_longitude, :param_latitude)::geography AS dist_m  
FROM roads  
ORDER BY dist_m DESC LIMIT 3;
```

# EXAMPLE QUERY 2

## Summarize Crime stats for NYC Boroughs

```
SELECT b.boro_name, count(*), c.type
FROM nyc_boros AS b
INNER JOIN crimes AS c ON ST_Intersects(b.geom, c.geom)
WHERE c.year = 2020
GROUP BY b.boro_name, c.type
ORDER BY b.boro_name, c.type;
```

# PostGIS raises the bar for RDBMS



# POSTGIS MODELS SPACE IN MANY WAYS

Flat, Round, Matrix, Relational (Declarative)

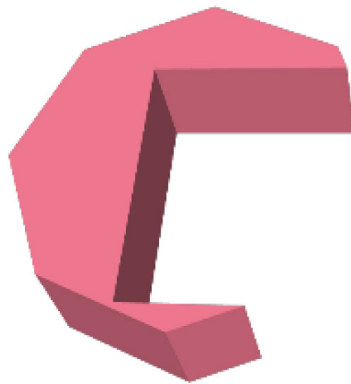
# FLAT: POSTGIS GEOMETRY TYPE

## extension: `postgis`

Space is a cartesian grid. Supports drawing of linestrings, polygons, 3D polygons, points, 3d points, collections of polygons, points, linestrings, Polyhedral Surfaces, and TINs



Basic geometric types



Polyhedral Surface



Triangulated Irregular Network (TIN)



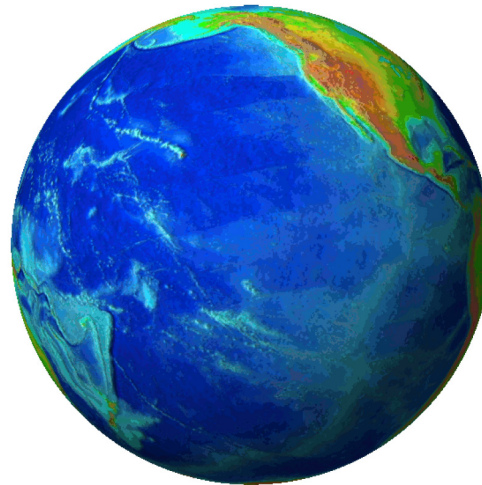
# ROUND: POSTGIS GEOGRAPHY TYPE

## extension: `postgis`

The Round space model. Space is the surface of a spheroid where you can draw linestrings, polygons, points, and collections of polygons, points, linestrings on the surface.



Basic types



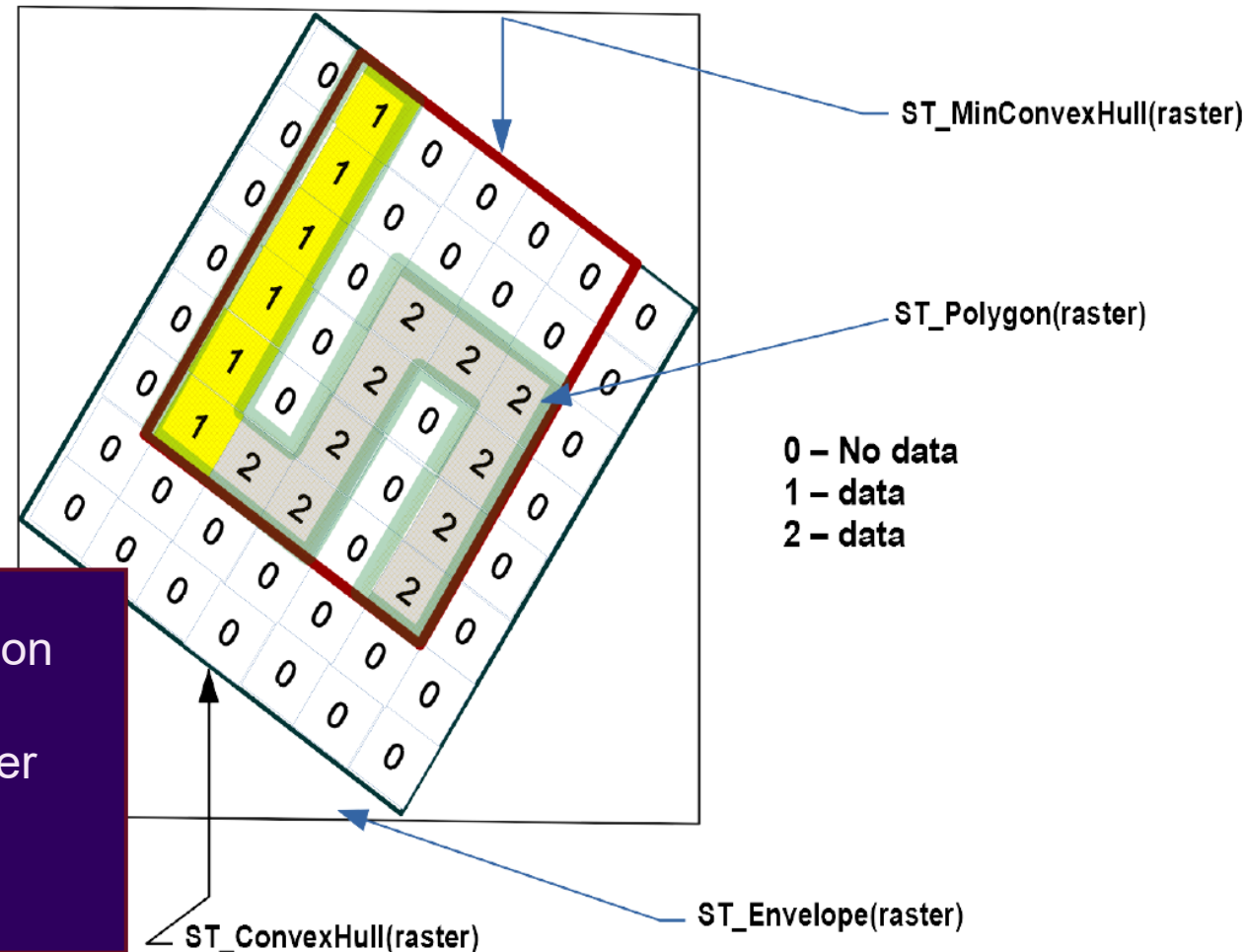
On the surface of a sphere

# MATRIX: POSTGIS RASTER

## extension: postgis\_raster

Model of space as a numeric matrix (with cells (called pixels) that have values (on) or don't have values (off)). Within that are things called bands that define the number of matrices you have stacked.

- Elevation
- Soil
- Weather
- Fire
- Aerial



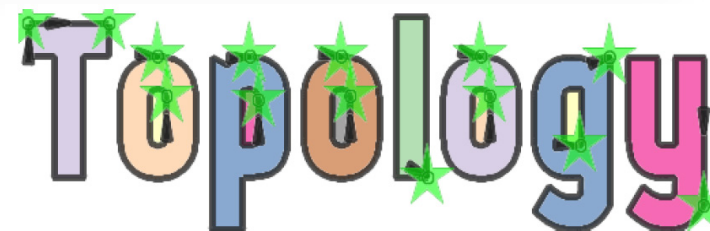
# RELATIONAL: POSTGIS TOPOGEOMETRY TYPE

## extension: postgis\_topology

Defined in SQL/MM Topology-Geometry specs. Spatialite has it too. Topology partitions space into edges, nodes, and faces. Then it says this thing called topogeometry is space composed of these edges, nodes, faces and other topogeometries (which are again just a bunch of edges, nodes, and faces). If two topogeometries have the same set of (edges, nodes, faces) then they are the same.

```
(1,1,2,3) -> topology_id, layer_id, id, type
```

```
SELECT topo::geometry AS geom, (topo).*  
FROM some_topo_table;
```

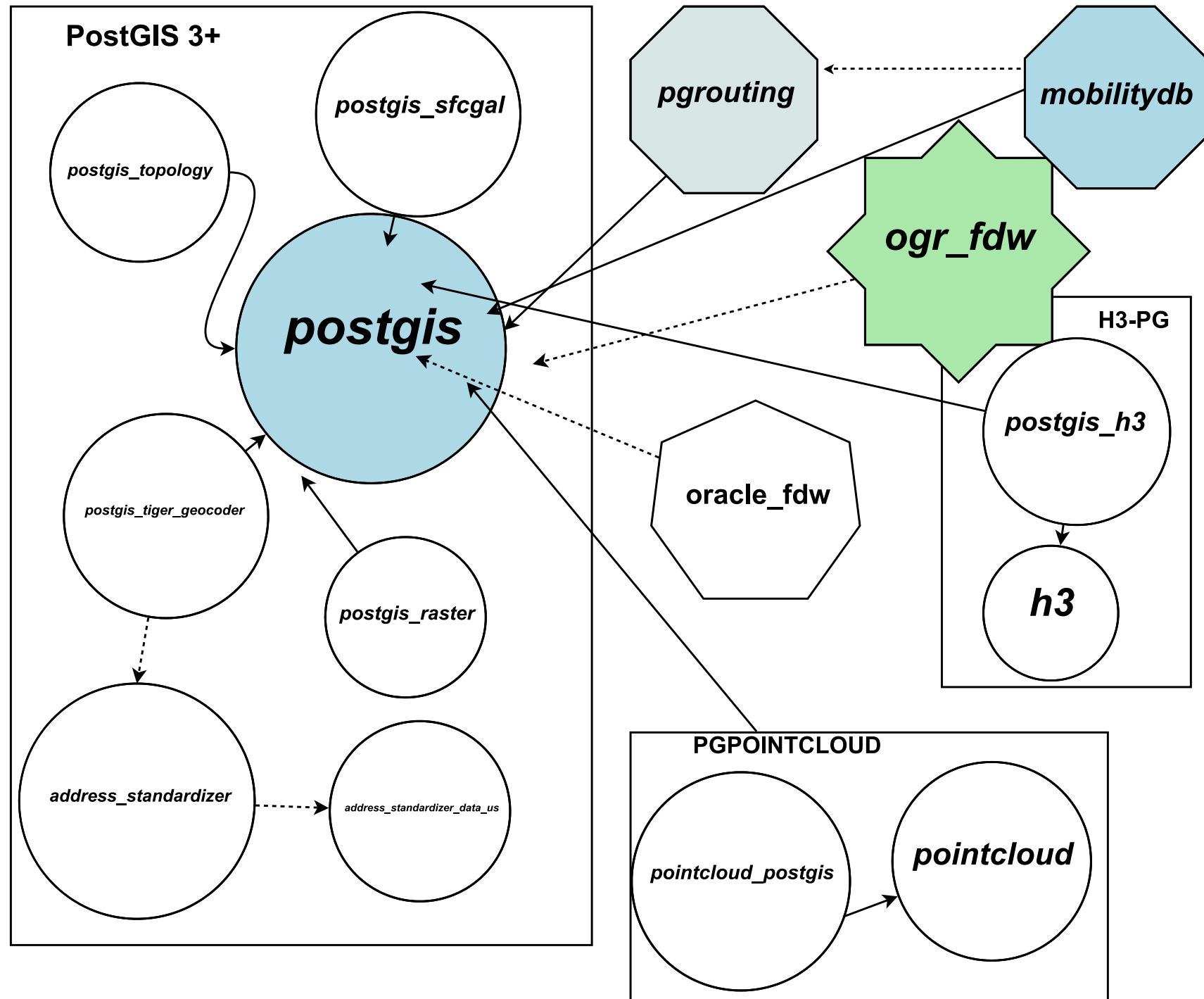


# POSTGIS HELPER EXTENSIONS

- **postgis\_sfcgal** - functions for volumetric and 3D surface
- **postgis\_tiger\_geocoder** - geocoding and reverse geocoding using US Census TIGER data
- **address\_standardizer**,  
**address\_standardizer\_data\_us** Rule-based address standardizer (useful as precursor for geocoding)

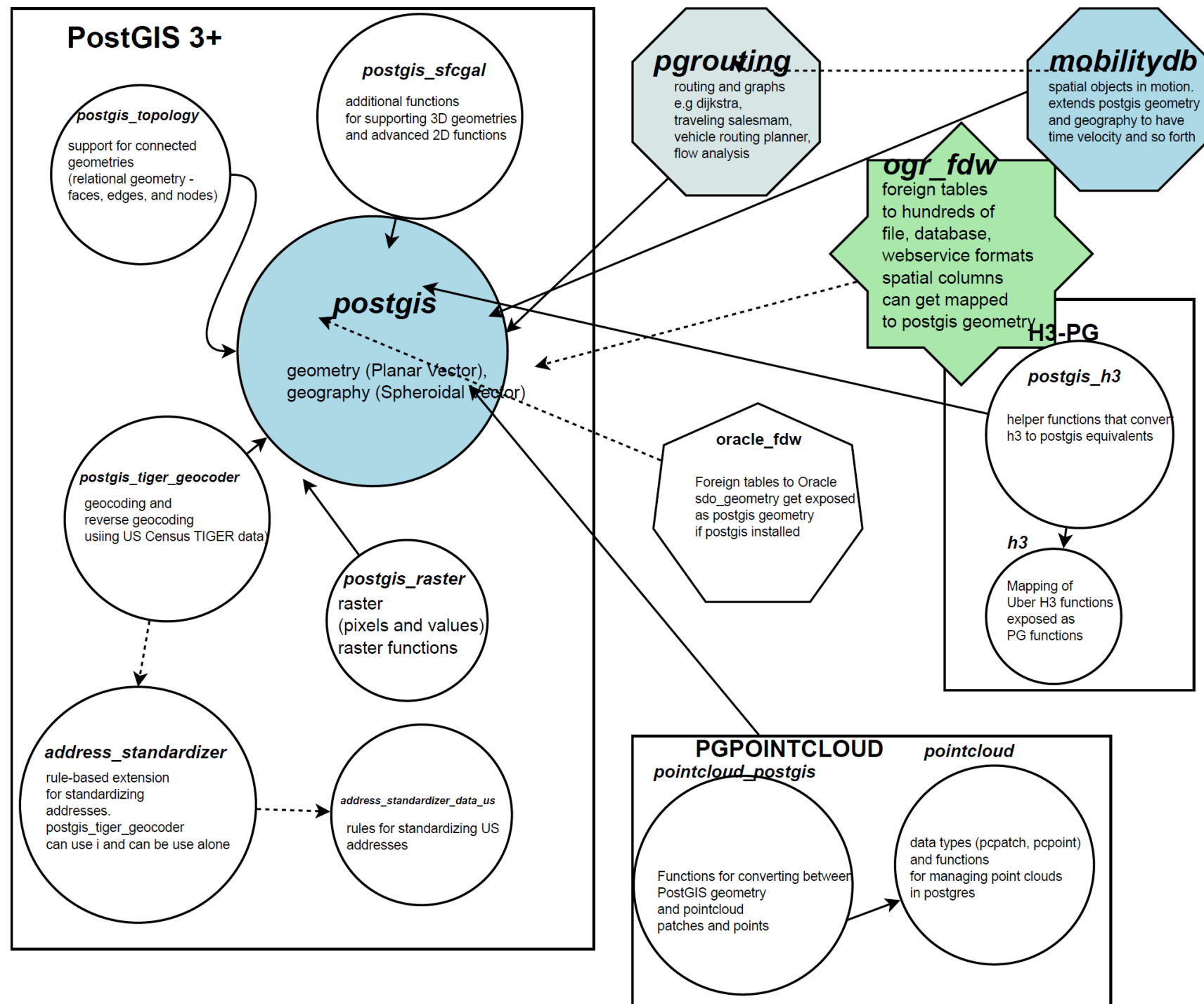
# POSTGIS EXTENDED FAMILY OF EXTENSIONS

CREATE  
EXTENSION ...;



# POSTGIS EXTENDED FAMILY OF EXTENSIONS

CREATE  
EXTENSION ...;



# THANK YOU

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