PostGIS – An Open-Source Spatial Database

What is PostGIS?

PostGIS is an extension to the PostgreSQL object-relational database server which provides the ability to store and index GIS features inside the database server.

- PostGIS supports all the OpenGIS Consortium (OGC) simple features: Point, Line, Polygon, MultiPoint, MultiLine, MultiPolygon, and GeometryCollection.
- PostGIS uses OGC well-known text format on the SQL command-line to represent GIS features.
- PostGIS provides high speed spatial indexing using GiST (Generalized Search Tree) or R-Tree indexes.

Like Oracle's OracleSpatial™ database extension or ESRI's SDE™, PostGIS provides a transactional spatial database, where multiple users can access and edit the same database simultaneously without file locking or data corruption issues. Unlike Oracle and ESRI, PostGIS is an open-source project without licensing fees or usage restrictions.

PostGIS was developed by Refractions Research of Victoria, BC as a research project in spatial database technology. More information is available at the PostGIS web site (http://postgis.refractions.net).

How is data loaded / accessed?

A couple of bulk data loading options are currently available or under development:

- **SQL** – Like Oracle, data can be loaded into PostGIS by loading text files of SQL commands into a SQL terminal monitor. The GIS features in the SQL command are represented in the format given in the "Simple Features for SQL" OGC specification.
- **Shape Data Load** – A data loader which reads ESRI Shape files and loads them directly into the database is under development.

Data can be accessed through a variety of channels:

- **Java Database Connectivity (JDBC)** – PostGIS includes extensions to the PostgreSQL JDBC drivers which allow transparent access to Java GIS objects from PostGIS via JDBC.
- **Open Database Connectivity (ODBC)** – Through the PostgreSQL ODBC drivers, PostGIS GIS objects can be accessed via their text representations.
- **SQL** – The SQL command-line interface provides a means of querying and extracting data from the database.
- **Internet Mapping Server** – The University of Minnesota Mapserver can use PostGIS as a data source. Mapserver supports the OGC Web Mapping Specification (WMS) and can also use Shape, MapInfo, raster and SDTS files as data sources.

What else is possible?

Currently, PostGIS is a spatial repository without applications, which limits day-to-day usefulness. However, there are a number of ongoing initiatives which would benefit from an open-source spatial database implementation:

- **OGC Feature Server Specification** – OGC will be releasing the Feature Server Specification to the public soon. An Apache HTTP server module could be written to provide a high speed Feature Server using PostGIS as the spatial backend.
- **BBN OpenMap** – OpenMap is an open-source Java mapping framework API which can be used to create rich Java-based GIS applications. OpenMap supports spatial database data layers, and a PostGIS layer could be written using the JDBC connectivity layer.
- **Academic Geography and GIS Research** – Academic and scientific programs cannot always afford the licensing and maintenance overhead of large commercial applications such as SDE and OracleSpatial. PostGIS provides an opportunity for researchers to work with spatial database concepts without a multi-thousand dollar investment.
- **Advanced Data Structures** – Using the SF geometries as primitives, advanced topologies such as coverages, dynamic segmentation schemas, and networks could be built. As an opensource product, PostGIS could be an excellent test bed for new data representation standards.

More Information

- PostGIS – http://postgis.refractions.net
- PostgreSQL – http://www.postgresql.org
- GiST Indexing -- http://www.sai.msu.su/~megera/postgres/gist/
- MapServer -- http://mapserver.gis.umn.edu/
- OpenMap -- http://openmap.bbn.com/
- OpenGIS Consortium – http://ww.opengis.org