Welcome to your AskTOM Office Hours session!

Your host will be with you shortly.

AskTOM Office Hours: Spatial & Maps in Oracle Database

https://asktom.oracle.com/pls/apex/asktom.search?oh=7761

- Explore location and geospatial features and map tools - *free* in Oracle Database
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    Melli Annamalai - Senior Principal Product Manager
    August 27 01:00 UTC
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The Spatial & Graph User Community

Part of Analytics and Data User Community

- Vibrant community of tech enthusiasts – customers, partners, students
- Sharing knowledge online, and at conferences and events.
- Global – Americas, Europe, Africa, Asia

Join us

LinkedIn Oracle Spatial and Graph group **linkedin.com/groups/1848520/**

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Spatial and Maps in Oracle Database Office Hours

Python and Autonomous Database: Better together for Location Analytics

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Everything happens somewhere!

Systems manage incidents, events, activities.

Are events occurring within a mile of each other? Which is the nearest? Which tax zone is this in? Where can we deliver within 35 minutes? Is this built in a flood zone?

Where are the unemployment hot spots? Are traffic crashes distributed randomly or correlated with location? What is the predicted future trend in home prices based on trends over time in surrounding regions?

Spatial data management

Spatial data processing, analysis

Spatial ML

Agenda

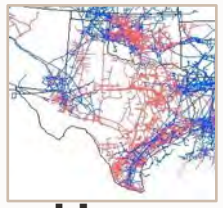
- Spatial in Autonomous DB
- Spatial libraries in Python
- Demo; best of both worlds

Spatial in Oracle Database

Deployable Components

Mapping	Geocoding	Routing	Web Services (OGC)	Studio

Points



Lines

Polygons

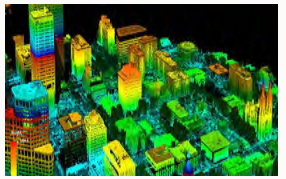
Location Tracking (Geofencing)

Networks

Address Geocoding

Linear Referencing

Raster



3D / LiDAR

Topologies

Spatial in Oracle Autonomous Database

FULLY-MANAGED

SEMI-MANAGED

CUSTOMER MANAGED

Autonomous Datawarehouse (ADW)
Autonomous Transaction Processing (ATP)

Shared / Dedicated

Spatial*

Oracle Exadata

Cloud Service/
Cloud@Customer

Spatial

Oracle Database Cloud Service

VM / Bare Metal

Spatial

Oracle DB on Compute

VM / Bare Metal

Spatial

* The following are not enabled on Shared: geocoder, 3D, ndm, georaster, topology, to/from_gml/kml , from_wkt/wkb, pt cloud/tin, gml, geo_search. Buffer and georaster are being enabled with ongoing ADW update based on 19c database.
Access to ORACLE_HOME is restricted so the following deployable components are not provided:
ndm, routing engine, spatial viz, web-based geocoder, ogc services. We plan to provide these on the Cloud Marketplace.

Robust Python geospatial library ecosystem

GeoDjango - Django geographic web framework.
Landsat-util - Landsat-util is a command line utility that makes it easy to search, download, and process Landsat imagery.
Rasterio - Rasterio employs GDAL under the hood for file I/O and raster formatting.
Rasterstats - Python module for summarizing geospatial raster datasets based on vector geometries.
PyQGIS - Python for QGIS.
GeoPandas - Python tools for geographic data.
Shapely - Manipulation and analysis of geometric objects in the Cartesian plane.
mapboxgl-jupyter - Use Mapbox GL JS to visualize data in a Python Jupyter notebook.
Cartopy - A library providing cartographic tools for python for plotting spatial data.
Rtree - For efficiently querying spatial data.
geoalchemy - Using SQLAlchemy with spatial databases.
geopy - geopy is a Python 2 and 3 client for several popular geocoding web services.
Fiona - For making it easy to read/write geospatial data formats.
PySAL - For all your spatial econometrics needs.
Descartes - Plot geometries in matplotlib.
PyShp - For reading and writing shapefiles.
PyProj - For conversions between projections.
chupaESRI - ChupaESRI is a Python module/command line tool to extract features from ArcGIS Server map services.
geojsonio.py - Open GeoJSON data on geojson.io from Python. geojsonio.py also contains a command line utility that is a Python port of geojsonio-cli.
Ogcserver - Python WMS implementation using Mapnik.
RSGISLib - The Remote Sensing and GIS software library (RSGISLib) is a collection of tools for processing remote sensing and GIS datasets. The tools are accessed using Python bindings or an XML interface.
OSMnet - Tools for the extraction of OpenStreetMap street network data.
geojson-area - Calculate the area inside of any GeoJSON geometry. This is a port of Mapbox's geojson-area for Python.
GeoDaSpace - Software for Advanced Spatial Econometrics.
Verde - Verde is a Python library for processing spatial data (bathymetry, geophysics surveys, etc) and interpolating it on regular grids (i.e., gridding).
gpdvega - gpdvega is a bridge between GeoPandas and Altair that allows to seamlessly chart geospatial data.
LANDSAT-Download - Automated download of LANDSAT data from USGS website.
USGS API - USGS is a python module for interfacing with the US Geological Survey's API.
som-tsp - Solving the Traveling Salesman Problem using Self-Organizing Maps.
Centroids - This application reads a valid geojson FeatureCollection and returns a valid geojson FeatureColleciton of centroids.
sentinelsat - Search and download Copernicus Sentinel satellite images.
PyPostal - Python bindings to libpostal for fast international address parsing/normalization.
python-opencage-geocoder - A Python module that uses the OpenCage Geocoding API.
rio-tiler - Get mercator tile from landsat, sentinel or other AWS hosted raster.
rio-cogeo - CloudOptimized GeoTIFF creation plugin for rasterio.
GIPPY - Geospatial Image Processing for Python.
ts-raster - ts-raster is a python package for analyzing time-series characteristics from raster data. It allows feature extraction, dimension reduction and applications of machine learning techniques for geospatial data.
LT-ChangeDB - Scripts to extract spectral change information from LandTrendr data to a geodatabase.
pymap3d - Python 3D coordinate conversions for geospace ecef enu eci.
untiler - Stitch image tiles into larger composite TIFs.
pyroSAR - A Python Framework for Large-Scale SAR Satellite Data Processing.
RIOS - Raster I/O Simplification. A set of python modules which makes it easy to write raster processing code in Python.
eo-box - Earth observation processing framework for machine learning in Python.
lidar - Terrain and hydrological analysis using digital elevation models (DEMs).
landsat-extract-gee - Get Landsat surface reflectance time-series from google earth engine.
satpy - Satpy is a python library for reading, manipulating, and writing data from remote-sensing earth-observing meteorological satellite instruments.
Python Geocoder - Simple and consistent geocoding library written in Python.
EarthPy - A package built to support working with spatial data using open source python.
scikit-mobility - Mobility analysis in Python.
MovingPandas - Implementation of Trajectory classes and functions built on top of GeoPandas.

Key geospatial libraries

Shapely

- Geometric object manipulation and analysis (cartesian)
- Handles standard formats (JSON, WKT, WKB)

GeoPandas

- Extends Pandas for geospatial (GeoDataFrame)
- Uses Shapely geo types/operations
- Uses add'l packages for i/o, plotting

PySAL

- Geospatial data science library
- Geostatistical, spatio-temporal, exploratory analyses (vast)
- i.e. spatial autocorrelation, spatial econometrics

cx_Oracle module

- Robust access to Oracle Database from Python
- Handles advanced features and data types
  - Object types (i.e. SDO_GEOMETRY), LOBs, JSON
  - SODA (Simple Oracle Document Access)
  - Array operations
  - Cursor support
  - Advanced Queuing
  - too much more to mention here…
- https://oracle.github.io/python-cx_Oracle/

Demo

https://bit.ly/devlive2020_spatialpython

Wrap-up

- Oracle Autonomous Database includes spatial data management, processing, and analysis
- Python ecosystem provides modules for specialized spatial analysis and data science
- Combining them is straightforward and effective

Resources - Oracle Database – Spatial Features

- Spatial Features Homepage: oracle.com/goto/spatial
- Map Visualization: bit.ly/OracleMapViz
- YouTube Channel: youtube.com/c/OracleSpatialandGraph
- Blog: blogs.oracle.com/oraclespatial
- LiveSQL tutorial (write spatial queries on 19c in 5 mins!): bit.ly/LiveSQLSpatial
- Forum: bit.ly/OracleSpatialHelp
- Oracle Spatial and Graph User Group: linkedin.com/groups/1848520/
- Twitter: @SpatialHannes @Jeanlhm @oraspatialsig

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